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CONTENTS

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle. By Lieut.-Commander Yates Stirling, U. S. N. 393

WAR ON THE SEA—Continued. By Captain Gabriel Darrieus, French Navy. Translated by Prof. Philip R. Alger, U. S. N. 429

THE PIONEER OF AMERICA'S PACIFIC EMPIRE: DAVID PORTER. By Lieut.-Commander Edward L. Beach, U. S. N. 543

THE TRUE STORY OF THE "AMERICA." By Robert W. Neeser 573

THE FIGHT FOR THE INITIAL POSITION. A Study in Naval Tactics. Translated by Lieut.-Commander H. F. Bryan, U. S. N. 581

SEUMANUTAFA AND FA'ATULIA. By William Churchill 601

THE STRATEGIC IMPORTANCE OF THE NAVAL BASE AT KEY WEST, AND ITS STRATEGIC LINES OF FORCE. By Commodore W. H. Beehler, U. S. N. 605

NOMOGRAMS FOR DEDUCING ALTITUDE AND AZIMUTH AND FOR STAR IDENTIFICATION AND FINDING COURSE AND DISTANCE IN GREAT CIRCLE SAILING. By Lieutenant Radler de Aquino, B. N. 633

NOTES ON RIFLE SHOOTING. By Midshipman E. E. Wilson, U. S. N. 647

SPOTTING AND RANGE-FINDING. By Captain Bradley A. Fiske, U. S. N. 655

NOTE ON THE PROBABILITY OF GUN-FIRE. By Lieut. A. Mazzuoli, Italian Navy 663

RECENT CHANGES IN BRITISH MESSING AND CANTEEN METHODS. By Paymaster George P. Dyer, U. S. N. 667

DISCUSSION 679

PROFESSIONAL NOTES. Prepared by Prof. Philip R. Alger, U. S. N. 701
Ships of War, Budgets and Personnel.—Ordnance and Gunnery, Torpedoes.—Marine Turbines and Gas Engines, Liquid Fuel.—Radio-Telegraphy.—Miscellaneous.

BOOK NOTICES 745

LIST OF PRIZE ESSAYS 749

SPECIAL NOTICE.—Naval Institute Prize Essay, 1909 754

ADVERTISEMENTS.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SECOND HONORABLE MENTION.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET.

HOW SHALL WE PREPARE IT FOR BATTLE.

By LIEUT.-COMMANDER YATES STIRLING, U. S. Navy.

Motto: "Heaven gives the laurels of victory in war to those only who keep themselves in training in time of peace, and win the battle before it is fought."

It is difficult to know where to begin in the wide field before us. There are so many excellent features in our present chain of development which are familiar to all, yet there are those of a lesser excellence and it is with these that we must work in order to attempt to point out how we may all lend our mite; the end in view being to put our naval forces upon a firm and unassailable footing.

The writer has, in his endeavors to analyze the many phases of naval expediencies, asked himself several questions which appear pertinent and in his answers he ventures to suggest ideas that seem both rational and timely.

How may those who decide upon the effective strength of our fleet be brought to an intelligent understanding of the nation's needs, both present and future?

If we are to build logically, that is only the types of ships which we know will be useful in war, we must first win the national congress over to our way of thinking and insist that not one dollar be spent for the navy that does not enhance its efficiency for battle. This seems at first thought a stupendous task—not because our legislators are unintelligent men, for they must be perforce the most intelligent—but because the counsels of their naval advisers have not always been in harmony. In other words, the service itself has not crystallized its opinions of the navy's needs. This unfortunate condition has been the indirect cause of many poorly designed ships—not structurally but tactically.

Naval men in the past, especially those of and below the grade of lieutenant-commander, have given but a small part of their time to the broad questions of naval policy, strategy and tactics; and is it not even more true to-day? Doubtless their defense is unimpeachable; their time has been absorbed by the multitudinous details of bringing the ships given them to a state of efficiency. There is, however, no reason why all officers should not be brought into the narrow channel of our logical naval policy. Their education and practical training on board the fighting ships should peculiarly fit them to judge the tactical value of the several fighting units of our naval force, and by the addition of close study with some analytical thinking, their views, clearly set forth, not in vague protests but in carefully prepared articles for the service magazines where theories and suggestions can be discussed and criticised, would help the entire service in its duty to see built only those vessels which will be needed in war; besides giving our naval constructors some tangible data from a sea-going standpoint to use in future designs; and withal, add to the slender literature upon a most important topic.

With the ships already in our hands, how may we increase their efficiency for battle?

Personnel.—The keynote of efficiency is contentment. When that is achieved efficiency is but around the corner.

The very able article of Rear-Admiral Goodrich in the September INSTITUTE aptly sums up the many petty annoyances in vogue in the navy which it is now high time to abolish. Our ships bear no resemblance to those of ancient date, then why insist upon retaining the other relics of bygone days? Emancipate the personnel from the old ideas that progress show are unsuitable; strip

the sailor of his senseless clothes which in the old days were emblematic of drunkenness and license, and dress him in a uniform that will not humiliate him by the frowns of those who know not of his changed character; then contentment will follow.

Efficiency in the personnel is not far to seek. Any one who has seen the able target practice of our ships will be convinced of that truth; yet it can be improved and when the internal regulations for the discipline on board ship have been given the rejuvenation that common sense tells us is needed, we shall have gone far to achieve it.

Materiel.—Efficiency in materiel lies first in the hands of the naval constructors who design and build the ships and then afterwards in those of the line officers who use them. Their harmonious co-operation alone will produce the proper degree of efficiency.

Even though the structure of the completed ship is faultless there will be many tactical defects which can only be discovered through the handling of the ship in the fleet. These are what may be termed *excusable faults* and will prove harmless if the sea-going officer can detect them in time and bring them to the notice of the naval constructor for correction on the spot and in future designs.

Discussions on faults in materiel in ships should be encouraged by the Navy Department in the same manner as were those on ordnance a few years ago, with such telling effect. The naval constructor should welcome these opinions from those who must eventually prove whether their creations are the fighting machines which they doubtless believe they are.

This may be summed up: Study your ship in the light of the use for which it is intended—*battle*, and not as a home for the crew; the latter is but a secondary consideration.

Having advanced to a state of quasi-preparedness, how may we insure a maintenance of efficiency?

The fleet should be active; it should be alive and form a thorough school for the proper training of officers and men. Our flag officers and captains should be trained to command the divisions of the fleet and handle the ships with facility. The junior officers and men should be trained to use their guns, torpedoes and fire control. The engineer's force must be able in maneuvers to maintain the speeds set by the commander-in-chief without breakdowns, which in battle would prove costly.

In full, the fleet should be maintained upon a war footing, not on paper but in reality and the money expenditure for this will be great, but unless we are to play the game properly even the money we have already expended has been thrown away. Preparedness can be achieved in no other way. The outcome of a battle can not be calculated with a pencil to-day more than it could in the days of Nelson. Fighting ship to fighting ship (per Jane) gave the Russians before the battle of the Sea of Japan the victory; yet we have seen the result. Preparedness on the one side and an equal unpreparedness on the other were the direct causes.

Broadly speaking, to maintain our efficiency we should build in proportion to our needs such vessels as we know will be necessary for offense and defense and the personnel of the navy should be increased in proportion to the ships built. Wages should receive their increase to keep pace with the wages ashore for similar classes of work with a proportion added to compensate for the less pleasant and unnatural life at sea.

Promotion should receive its share of attention: officers should reach the several grades at an age when they will give their maximum efforts to the service. Flag officers and captains should have enough service ahead of them on the active list to train them in handling ships and fleet and yet be in their prime to utilize the priceless knowledge gained in preparing others for their places.

Does the enlisted force of our navy become stale?

All officers will agree that under the present strenuous system in the navy an officer after three years of active duty will become stale. Then why should not the same hold for the enlisted man? Every officer must remember how impatient he became when his time for shore duty was approaching; if not his messmates surely will; then why should not the sailors be similarly affected—are they not made of the same flesh and blood—and may not this psychological trait of human nature have something to do with the causes that refrain men from re-enlisting? After four years of service even four months free to indulge himself will not entirely cast from the sailor this staleness. He longs for a change and the idea of four more years in active service is repugnant. If he were given his four months' leave to visit his relatives and then could report back to a shore station and be assured at least one year ashore, the outlook might be different. There are many useful places for such men at short stations and after this service they

could be drafted again into active duty bringing fresh blood and more steam to add to the total efficiency. How much pleasanter this would be than forever starting at the beginning with recruits?

What is the relation between offense and defense?

It is surprising to find how many of our well-informed countrymen still believe that the navy's sole duty is to defend the nation from attack. To the navy defense and offense are synonymous.

A nation that is weak in naval power must be content to keep to her own affairs, if not, sooner or later she must choose between two alternatives; throw down the gauntlet and go to war with a stronger naval power, or else recoil before the threat.

The surest way to defend the nation is to seek the enemy on the sea with a superior force, but even with a victory, there would be many crippled vessels seeking shelter and repairs, and thus a second line of defense is necessary. But more especially do we need these defenses in the absence of the war fleet. If our ports were undefended they would be at the mercy of a few of the enemy's light cruisers sent in order to hamper the movement of the war fleet by drawing it back to its base or causing its numbers to be reduced by an unwise administration through the far-reaching outcry of the panic-stricken inhabitants of the coast cities. Thus we see that the defense must be a necessary adjunct to the offense, developed to such an extent that when the fleet sails the non-combatants may with tranquil minds continue their peaceful pursuits without thought of danger from the attacks of the enemy.

The units of naval defense should consist of:

(a) The slow battleships dropped from the offensive fleet.

(b) Torpedo boats.

(c) Submarines.

Large vessels for defense alone are mistakes.

Where should the war fleet be concentrated?

It has been said by many writers on strategy that the peace distribution should be the war distribution; for war is but a step, taken frequently after only a few weeks of fruitless diplomacy. We have taken some years to learn our lesson—not to divide the fleet, so whatever locality is chosen, it should be a unit.

Before the day of our colonial launching (May 1, 1898), either coast of the United States might have served. But is it so to-day? To the writer it is clear that the Pacific is the logical position for the war fleet. The theatre of war will be the Philippines; for

there we are most vulnerable. It would be an unwise policy to keep the fleet in tropical waters, but in order to exploit the resources of our insular possessions the fleet should make an annual cruise from the Pacific coast to the Philippines, conduct target practice in Manila Bay, engage in carefully devised strategical and tactical maneuvers, and then return to its base.

Under this question it seems appropriate to suggest that, if this is to be the policy of the nation, it would be a wise measure to give it out authoritatively in order that the shipyards of the Pacific and Atlantic coast may adjust themselves to the changed conditions.

For the Philippines, Manila is the key to the archipelago, and can be defended only so long as we are able to dispute the command of the sea. In order that the war fleet may defend us in our island possessions there should be dock yards in Manila Bay of sufficient capacity to maintain the fleet efficiently. Submarines in conjunction with the artillery defenses and numerous torpedo craft would go far to defend the base in the absence of the fleet or until it arrives from its home waters.

How should the war fleet be trained in order that it will be equal to the task of fighting an enemy's fleet?

This can only be accomplished by simulating the actual conditions of war.

The science of tactics has stood still for some years; so far it is mostly in theories. What is known up to date may be condensed in a few words:

(1) All else being equal and both fleets considered infallible in maneuvering, the advantage will lie to chance. Either fleet may by her accidental position when the enemy is sighted have both the sun and weather gauge, which would become a factor in its chance for success.

(2) If one fleet has the greater speed, then, unless the nearness of the land will hamper the slower fleet, the opportunity of maneuvering for concentration will be equal by both fleets steaming on the arcs of concentric circles whose radii are in proportion to their respective speeds. The faster fleet can choose the range to fight or avoid battle as it desires.

A greater speed, as a rule, means that the slower fleet is stronger in gun-fire and armor protection unless the tonnage of the faster has been vastly increased, as in the latest designed ships.

But it might readily mean that the slower fleet is composed of one or more obsolete vessels which should have been dropped from the ranks of the war fleet.

The ABC of tactics is the "Game Board"; it will show graphically the value of concentration and the positions of the fleets when this advantage is attained. But the actual maneuvers are vastly different, and one trained by the game board alone may rightly be a failure in battle. The actual ship is not as tractable as the game-board effigy and besides the admiral's eye from the conning tower of his flagship does not see the fleets on a flat surface, showing the angles at a glance. An admiral, who is able upon the first attempt to appreciate the exact positions of the fleets in battle tactics, has the *sea eye* and we need him in our business.

Strategy and tactical games are of value for *all* officers as a part of their progressive training. Problems might be sent out from the war college each year, or more often, to all ships, navy yards and stations, to be played and solved by the officers on duty; the solutions to be sent to the war college. This would stimulate the minds of the officers of the service in considering the units of the fleet with their proper valuations and teach them the elementary points without which they must wait until they are fortunate enough to be ordered for the war-college course.

Sea experience will come through exercises in maneuvers, both strategical and tactical. For the younger officer it will consist of constant training for intervals in his numerous duties on board the fighting ships, with the view of making him resourceful and awake. At sea and in maneuvers he should be as much at home upon the bridge of a battleship as a cavalryman is on the back of his horse. Hand and brain should be trained to work in perfect harmony. Intuitively, when an emergency arises, he should know how to act to avoid danger. For the higher officers—admirals and captains—sea experience will teach the proper handling of the fleet and its units under stress of weather, in all manner of evolutions, in both clear and foggy weather. It will give them the necessary confidence in themselves and will show the amount of confidence they may repose in their subordinates.

Practical strategy can only be mastered through maneuvers in which all tactical units will take part. In strategical maneuvers all manner of weapons can be given a practical test and in its

operation officers will be taught in what manner their ships will be utilized in war.

Tactics has been defined as the art of handling ships in the presence of the enemy. Another writer, in an article in the *United Service Magazine*, divides tactics into four classifications:

(a) Distant touch (over 20 miles, when the smoke of the enemy's fleet will show its bearing, but not its formation).

(b) Visible touch (10 to 20 miles, when the enemy's fleet will be in sight and some estimate can be made as to its numbers and formation).

(c) Battle approach (4 to 10 miles, when the enemy's fleet can be seen distinctly and it can be seen accurately, more or less, the course, formation and speed).

(d) Battle tactics (under 4 miles, when fire will have commenced).

This division is clear and the terms opportune.

During battle approach the fleets will maneuver for position advantage, during battle tactics they will maneuver for range advantage.

The same writer also gives us terms to express these maneuvers:

(1) Range movements (to alter or maintain the range).

(2) Position movements (to gain a position for concentration).

Position movements are so well understood that it seems unnecessary to dwell further upon them, but range movements open up a very wide field.

Accurate gun-fire must decide an action, and for accuracy at long ranges the correct sight-bar range must be known. To gain an advantage a fleet must be able to keep the correct sight-bar setting during a longer interval of time than its opponent. This advantage might be termed the RANGE GAUGE.

The faster fleet, maintaining position equality, is free to use range movements to get the range gauge.

In Fig. 1, there are shown two fleets (only the flagship of each is represented) in parallel columns at 8000 yards range, where battle tactics begins. The black squadron is supposed to have a speed of 18 knots and the white, 16 knots. Black can execute a range movement of 26 degrees and yet maintain position equality with white. If the speeds were 18 and 15, black could turn simultaneously through approximately 36 degrees, maintaining equality.

Black, in executing a range movement toward its enemy, will know almost exactly its rate of change of range while white must first discover the amount of change in course of black, a more or less difficult task for white's shells will be going over the black vessels where they will be concealed by their hulls. White seeing

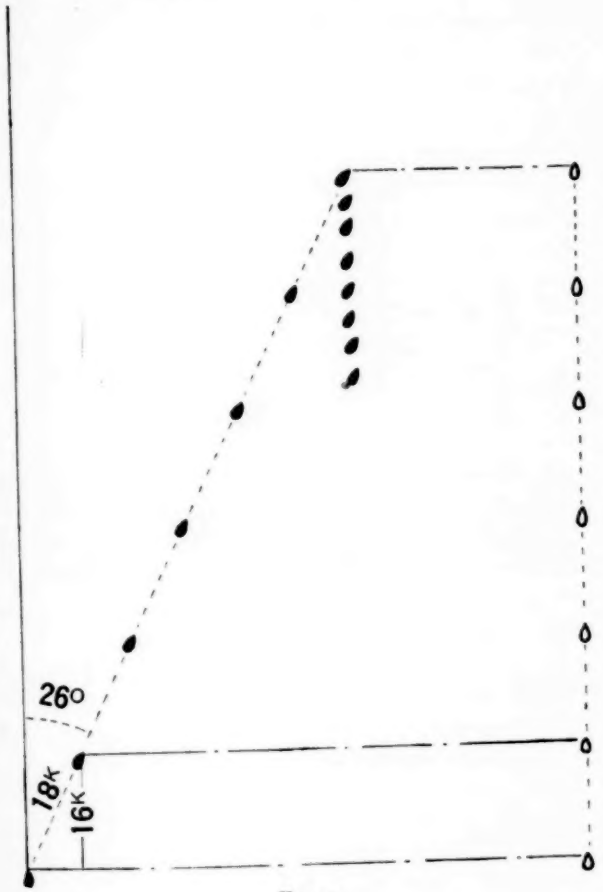

FIG. 1.

that black maintains its bearing despite the excess of speed will soon know that it has changed its course but it will not know the amount and when it discovers the true state of affairs, black can turn again in the same manner, either away or towards white. For 2 knots excess of speed then the faster fleet is safe to turn through 26 degrees to either side of the course.

If the slower fleet executes a range movement it will lose in position equality.

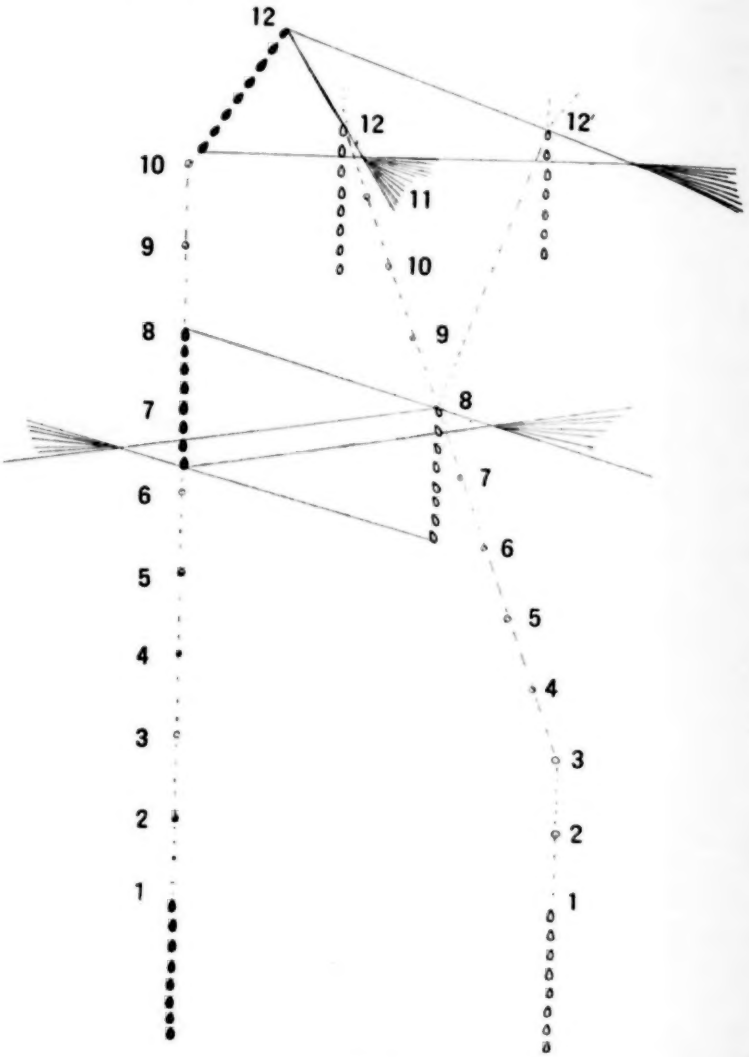

FIG. 2.

This seems almost axiomatic, but it can be clearly seen at a glance in Fig. 2.

At position 3, white, the slower fleet, executes a range move-

ment while black, with its superiority of 2 knots, keeps its course with the result shown at position 12 (the same would hold at 12′, where at 8, white executed another range movement away from black) where white forms column in an attempt to turn away and relieve itself from the embarrassing position.

This may be stated as follows:

The advantage of initiative in range movements lies with the faster fleet.

The initial range movement of the faster fleet should be towards its enemy.

In Fig. 3, a black fleet of 18-knots and a white fleet of 16-knots speed are shown at position 1 in parallel columns on terms of position equality. The range of each ship in column to its opposite is 8000 yards. For simplicity but two ships are shown (leader and rear), and the positions of the leaders are plotted every three minutes. It is supposed that each fleet has an accurate range-finder capable of being used only before fire opens and that each is fitted with the most improved range-keeping instruments. No allowance in the figure has been given for the advance and transfer in turning.

The slower fleet, wishing to engage in battle and in order to maintain position equality, is supposed to steer on the arc of the circle keeping the enemy's leader abeam of its leading ship. If this maneuver is done accurately and both fleets remain in column the change of range will be zero; but practically it will increase for black will draw ahead before it turns toward white and the latter will also be late turning away.

[1] First considering the black fleet: it will know that its 2 knots excess speed will increase the range approximately 17 yards a minute, which it will use as the first change of range; this will be 50 yards in three minutes. Using this change, at 3 (Fig. 3) the black instruments will read 8100 yards. At 3, black executes ships right, 10 degrees. Supposing that white maintains its course the range will decrease approximately 110 yards a minute; this black uses on its instruments. In the example black keeps this line of bearing formation until it arrives at 10, where its instruments will read (provided black makes no spotting correction nor change of

[1] The rates of change of range are only approximate. The change of range curves were drawn after this work was completed. The errors are, however, small and do not affect the principle.

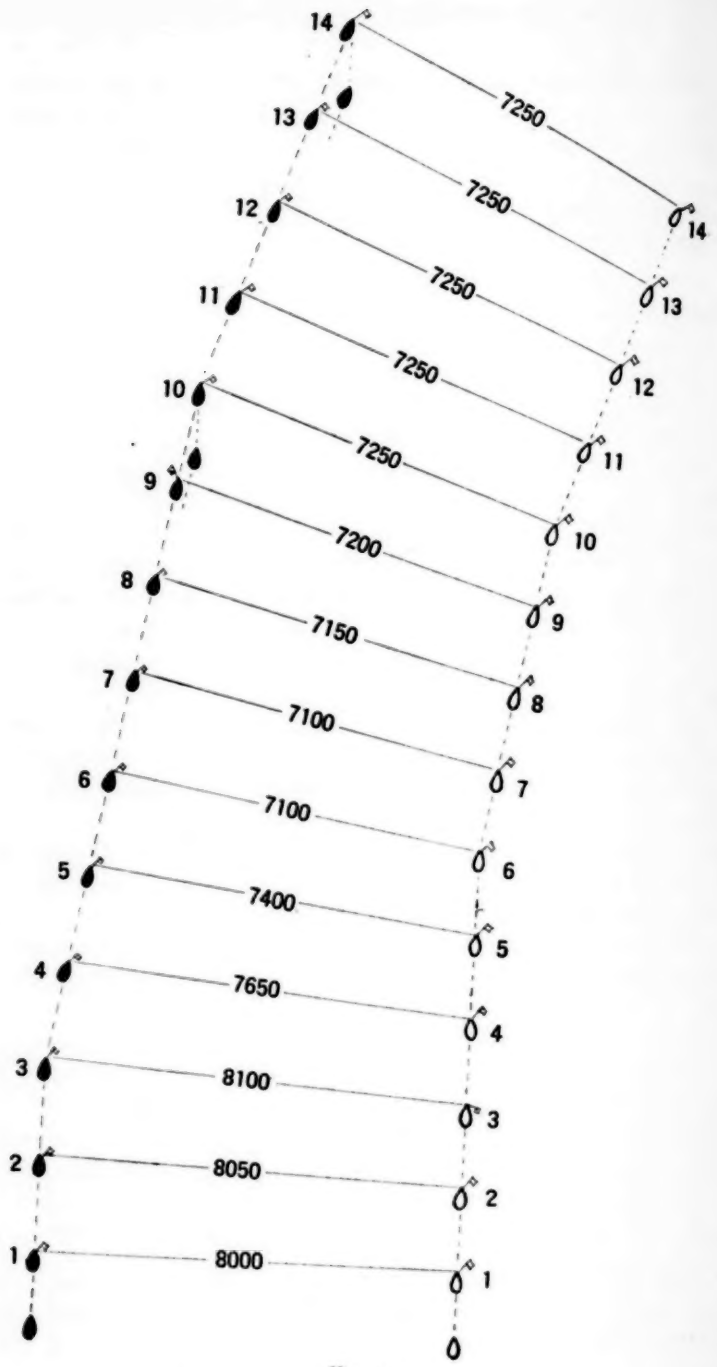
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FIG. 3.

range rate for the suspected change of course of the enemy) 5790 yards. At 10, black is shown to again execute a range movement to the right of 10 degrees; the new change for the range-keeping instruments will be 220 yards a minute, decreasing, and in consequence at position 14, black's instruments will read 3150 yards.

Now let us go to the white fleet: its instruments at 6 where it changes head of column 10 degrees right will be 8250 yards, from there using a change of range of 110 yards a minute, increasing, its sight-bar range for positions 7, 8, 9, and 10 will be 8585, 8915, 9245, and 9575, respectively. At the last position white is shown to change head of column once more 10 degrees right; then using the new change of range 220 yards a minute, at 14 its instruments will read 12,210 yards.

If neither fleet spotted and allowed for no change in course of its enemy, the advantage would be negative for each, but each fleet will spot and estimating the course of its enemy will use this apparent decrease or increase of the angle of approach to obtain the new rate of change of range. Therefore the advantage will be with the faster fleet, for it will be the one to take the initiative and in making its first change toward its enemy, can tell by its own shells falling short that the enemy has turned away, and by estimating the amount short its shots are falling will readjust its rate of change of range. White's shells on the other hand are falling over the black's ships and to the disadvantage of the white spotter.

To demonstrate this more clearly:

At 3 (Fig. 3) black having the correct change of range, its sight-bar range at 6 will not be much in error; it is 7100, the same as by measurement on the diagram. Here white changing course away from black the latter's shells will begin to fall short; in three minutes, or at 7, black's shots will be falling over 400 yards short of the white vessels. Black should certainly appreciate the meaning of this error in sight-bar range, and by estimating the amount short and the time interval since its shots were hitting or at least obscured by white's hulls, it has the opportunity to estimate more or less exactly the amount of change in the course steered by white, giving at once a new rate for his instruments. For example, black should estimate that white has changed through 10 degrees, away, and (neglecting the small increment of change for the difference of speed) its change of range should be zero. Now

by raising the sight-bar range for the spotted error and with the new change of range—zero, the black instrument will read the correct range. Then at 10, supposing it estimated the amount short at 7 correctly, the sight-bar setting will be 7320 yards. From this point, having made another range movement of 10 degrees toward the white fleet, black, using a change of range of 110 yards a minute, will see its shells falling short by reason of the white fleet having changed the course of its leader 10 degrees to the right; but in three minutes, when black's instrument will read 6990 and the correct range 7250, the amount short can be estimated and the spot applied to the black instrument with the new change of range calculated from the time interval as before; thus, at position 12, black raises 250 yards and uses (0) yards a minute change of range in consequence of which at 13 its instrument will read 6990 plus 250 plus 0 or 7240 yards and again at 14 the same.

On the other hand the white fleet will not be so well off:

At 3 its instrument will read correctly but almost immediately its shells will be flying over the black ships and as *overs* cannot be seen the white spotter must step down his instrument by bounds until the shots fall short; this will take time, but eventually we shall say he can do it and will get the range and interval as was done by black above; meanwhile, however, black has kept the range and white would have suffered severely. Also as shots hitting the enemy will probably be spotted as *overs* the white spotter will hesitate before dropping the sight-bar range sufficiently to see the splashes—more time lost to white and to the advantage of black.

The slower fleet of course can execute range movements and being the stronger would turn toward its enemy, but the faster fleet alone can do so with perfect security, for white (the slower) cannot expect to maintain position equality unless the resolved speeds of the two fleets are equal.

It seems highly improbable with two fleets equally well-drilled in battle tactics that either will, except by a stupid blunder, place itself at a disadvantage in position, thus allowing the enemy to concentrate its entire gun-fire upon one or two of the other's ships; so the *range gauge* is likely the one to be sought in battle.

This leads to a suggestion of a plan for battle-tactics drills in order to train the fleet and especially the admirals and fire control

to become familiar in the methods of seeking this advantage and holding it as long as is necessary to defeat the enemy. The drill will teach the relation of the admiral to fire control and show that he must rely upon gun-fire to tell him what his eyes will fail to do at such great distances. When an enemy changes its course, if the fire control has made an error in the estimated course of the enemy, the fall of the shots if short will tell the spotter that the enemy's course has been estimated incorrectly, thus giving a wrong angle of approach, the fire control should be able to correct this error and at once notify the admiral. *The admiral in other words is truly the chief fire-control officer of the fleet.*[2]

If ships could be supplied with range-finders accurate within 100 yards at battle touch and capable of being used during action with precision, the subject of fire control would be at once placed upon a different foundation; the enemy's fleet could be plotted on a large scale chart together with the admiral's own ships and he could see at a glance how matters stood. The fire control would then have something to check their guesses. In drill, however, plotting can be done with more or less accuracy, even though it be necessary to resort to a range-finder similar to that used by Commander Fiske on the *Cincinnati* some years ago; it consisted of two azimuth telescopes mounted one at each end of the ship, the observers being in telephonic communication, and the range was solved in but a few seconds through the use of sliding scales. Experience with the instrument would allow observers to get the range certainly within 100 yards. Before gun-fire begins, it is evident that an admiral would track his enemy on a chart with his own fleet plotted, and, an initial point or origin for the maneuvers to follow being so important, it would be wise to have an *accurate* range-finder on board each ship even though it cannot be used in the battle.

A proposed method of drilling fleets in battle tactics.

As has been claimed, range movement can be initiated only by the faster fleet, the slower for its own safety being forced to keep the enemy's leader abeam and thus, changing by small increments,

[2] The Range Projector invented by Lieut.-Commander J. M. Reeves and Lieutenant R. D. White, U. S. Navy, is now being installed on all ships. In setting this instrument the only unknown quantities are the course and speed of the enemy. Spotting only will give us the errors in these. The Projector is a practical solution of the range curves.

steer on the inner arc of the circles whose radii are in proportion to their speeds. If the faster fleet should execute range movement then the slower fleet may follow the lead set, always being careful that in the end the speedier antagonist will not gain position advantage. With a difference in speed of 2 knots, a likely one, the faster will not lose in position equality if it limits itself to within 26 degrees on either side of the enemy's course; if 3 knots the angle is 36 degrees, the limit of fire arcs. If the faster fleet keeps within its *speed angle* and the slower uses range movements then the latter's resolved speed in the direction of the front decreases as the angle of its turn is increased. With equal speeds range movements will probably be the deciding factors in battle; the main point being when to execute a range movement in order to keep the correct sight-bar range and at the same time prevent the enemy from holding it for more than short intervals.

It has been stated by writers on tactics that a range movement can be answered by a range movement through a like number of degrees. This is simple in theory, but in practice can the other fleet see the change in time to take advantage of it: if it were as much as 40 degrees, the maximum possible and keep fire arcs bearing, the change would doubtless be seen yet would the second fleet know with accuracy how many degrees the enemy had turned—every error of 10 degrees in the estimate means a change of range of 110 yards a minute and the *danger space of the vulnerable battleship at 7000 yards is 84 yards while at 6000 yards it is 104 yards.*

If the slower fleet is attempting to avoid action and turns away simultaneous through 40 degrees, 2 knots difference in speed will allow the faster fleet, by turning through a like number of degrees to close with the slower fleet at the rate of much less than 50 yards a minute, supposing each ship turns in its track, but it is hard to reconcile why the slower fleet should wish to avoid action on these terms unless the slower were *Connecticuts* and the faster *Michigans.* On the other hand if the slower fleet (logically the more powerful) turns toward the faster fleet, it is evident that fast's move is to turn away and with its greater resolved speed in the direction of the line of bearing of the enemy's fleet gain in position advantage.

If we would use two fleets or squadrons in drill to exploit the many theories of range movements we would arrive at some definite conclusions and then know from where to build.

An attempt has been made in Fig. 4 to show the progressive steps of a drill of this kind. To train the personnel there seems no good reason to set definite speeds; in fact it were better for efficiency to allow each to make the best speed possible in maintaining position, and yet it might be an advantage to assign speeds in order to settle certain disputes as to their values.

The following drill can be conducted on a game board but the realities of maneuvers—the time from when a signal is first hoisted by the flagship for a successive maneuver until the fleet may with safety execute it—will impress those participating much deeper than the mere demonstration on cold wooden boards.

Conducting the drill.—Umpires and assistants are placed on board each flagship. (The flagship alone is considered in this description although the drill should be further conducted to train the captains and fire control of each ship.) The umpires are connected to those of the enemy by wireless telegraph or telephone. In the chart house will be placed a plotting board upon which will be plotted as accurately as possible the positions of the fleets at the commencement of the maneuvers and at every interval of three minutes. The umpires may use all instruments for navigation, including the standard compass, range-finders, or any other accurate instrument for determining the range. The revolutions of the engines with their multipliers will be sent to the plotting room as frequently as needed in the plotting. The umpires on each flagship will know when ready to plot a position all the data necessary (exchanged by wireless) also the sight-bar ranges being used and all changes of range with the time of change used by each flagship (a range receiver might be placed in the chart house to facilitate this, one for each calibre). When the enemy is using a range within 250 yards of the plotted range the admiral and fire control are to be informed. When a flagship is using a range 500 yards short of the plotted range the spotter is informed by the umpires; when the ship is using a range of 500 yards over the spotter is likewise informed. Three minutes is allowed to spot back on the target.

In Fig. 4 the fleets (the flagships) are shown as they would be plotted by the umpires: first position in parallel columns at 8000 yards. The solution of the problem is given below in tabulated form similar to that which would be made out at the end of the drill. In the figure no allowance has been made for advance and transfer in turning, but in the drill this would be done.

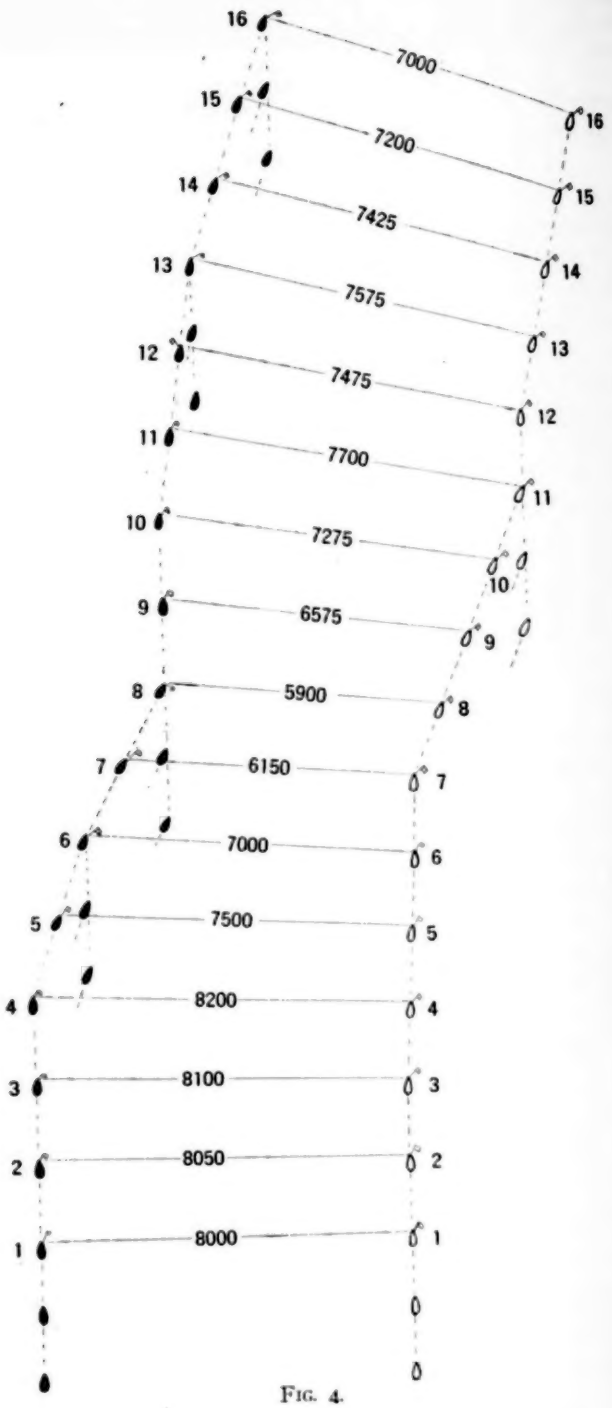
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FIG. 4.

The distances between the flagships will not be the same as those between the following vessels unless only range movements are used. In the figure white is shown to have executed a change by leader which will incline its line of bearing away from the original front thus decreasing the range between the following ships.

No mention is made in the remarks in regard to the hoisting of signals but this will be an important point in the maneuvers and the time must be worked out practically. In a long column it doubtless will be appreciable. In this connection a repeating ship or ships stationed on the disengaged flank at sufficient distance suggests itself.

The movements of the two fleets are not intended to demonstrate the proper maneuver at the proper time but merely to illustrate what might happen during the progress of a drill.

The speeds assumed are black 18 and white 16 knots.

ON BOARD BLACK FLAGSHIP.

Time.	Pos.	Remarks.
0.00	1	Range clock set for range 8000 yards (course N). Change of range by difference of speeds (2 knots), 17 yards a minute increasing.
0.03	2	Opened fire-range 8050.
0.06	3	Range 8100. White had range.
0.09	4	Range 8150. Black executed range movement right of 20 degrees. New change of range 200 yards a minute, decreasing. White had range.
0.12	5	Range 7550.
0.15	6	Range 6950. Black executes range movement to the right of 10 degrees. New change of range 300 yards a minute decreasing.
0.18	7	Range 6050. White had range.
0.21	8	Range 5150. Umpires notified black spotter that all of his shots were beyond the limit short. Black ceased firing to get the range. Black turned into column.
0.24	9	Black given range by umpires to be 6500. Estimated enemy is steering 20 degrees to right of old front or NNE, and used new change of range 200 yards a minute, increasing. Opened fire. White had range.
0.27	10	Range 7100. Black executed range movement of 10 degrees right. New change of range 100 yards a minute. White had range.
0.30	11	Range 7400. White had range.
0.33	12	Range 7700. Umpires notified that shots were all over. Ceased firing.

Time.	Pos.	Remarks.
0.36	13	Given range 7600. Estimated enemy in column. Executed range movement to right of 10 degrees. New change of range 100 yards a minute. Opened fire.
0.39	14	Range 7300.
0.42	15	Range 7000.
0.45	16	Range 6700. Battle ended.

ON BOARD WHITE FLAGSHIP.

Time.	Pos.	Remarks.
0.00	1	Range clock set for range 8000 yards. Change of range 17 yards a minute, increasing.
0.03	2	Opened fire. Range 8050.
0.06	3	Range 8100. Black had range. White leader turned through 3 degrees, keeping black leader abeam. New change of range 33 yards a minute increasing.
0.09	4	Range 8200. Black had range.
0.12	5	Range 8300. Umpires notified that shots were all over. White ceased firing. Black had range.
0.15	6	Given range 7000. Estimated enemy steering NNE or 20 degrees from original course. Used change of range 167 yards a minute, decreasing.
0.18	7	Range 6500. Black had range. White executed a range movement to the right of 20 degrees. Used new change of range 33 yards a minute increasing.
0.21	8	Range 6600. Umpires notified white that his shots were all over. White ceased firing.
0.24	9	Given range 6600. Estimated enemy heading N or in column. New change of range 233 yards, increasing. Commenced firing.
0.27	10	Range 7300. Black had range.
0.30	11	Range 8000. White turns into column. New change of range 33 yards a minute.
0.33	12	Range 8100. Notified all white shots over. White ceased firing and leader turned to right through 13 degrees with black leader abeam.
0.36	13	Given range 7600. Estimated enemy's course NNE, used change of range 66 yards a minute, increasing.
0.39	14	Range 7800. Black had range.
0.42	15	Range 8000. Black had range. Notified all shots over. Ceased firing.
0.45	16	Battle ended.

NOTE.—The changes of range are not from curves; the latter would have been more accurate.

In working up the data it was attempted to be as fair as possible in estimating the course of the enemy, but the result seems to show that the faster fleet would have the advantage. From the

data, black was within 250 yards of the correct range for over 30 minutes while white held it for but 15 minutes. Better judgement on white's part may counteract some of this advantage, but as has been said in doing so by frequent range movements toward its enemy it will lose in position equality.

It seems to the writer that superior fire skill can best be exploited through each ship firing at her opposite in the enemy's column. When several ships are firing at the same ship the fire control certainly will have great difficulty to identify his own splashes from those of friendly ships. The Japanese used their position advantage to concentrate upon the point at which the enemy's leader turned away to parallel their column; this is a stationary target at which each ship of the enemy must arrive to turn into the wake of the leader and the Japanese knowing accurately their angles of approach seemed to have done great damage at these points. This is undoubtedly the true use of concentration, at any other time it would be uneconomical.

In the drill outlined above it might lend realism to the maneuvers by burning tar barrels on the forecastles of the ships to simulate the smoke of battle; this would settle the dispute between flag signals and other methods. The smoke must not be so thick as to interfere with the plotting.

During the drills, battle stations only will be occupied by the ships' officers (a gyroscopic compass in each conning tower will be found necessary for those vessels that steer from that position) and the speeds assigned should be the best possible for the slowest ship. By using homogeneous squadrons, engineering efficiency would have a more valuable test than by speed runs singly and the fatality of a breakdown would show at its true value in the reports of the results of the battle.

It may be claimed that a range movement of only 10 or 20 degrees will not change the range fast enough to give a decided advantage and that nothing less than 40 degrees should be used.[3] A range movement of 40 degrees will change the range approximately 342 yards a minute for a difference in speeds of 2 knots, which would doubtless be a great advantage, but a watchful enemy would see such a change at once and would immediately turn through a like number of points and except for the delay in

[3] From curves—18-knot fleet turns through 40 degrees; 16-knot; steers to front.

turning could to a degree nullify the range gauge of its enemy. On the other hand a turn of as much as 20 degrees could not be appreciated at six or seven thousand yards and the latter will give the fleets in question a change of range of 145 yards a minute or 435 yards in three minutes. If one fleet can keep its enemy continually guessing at the range while it has some concrete data to fall back upon, then this surely will be an advantage.

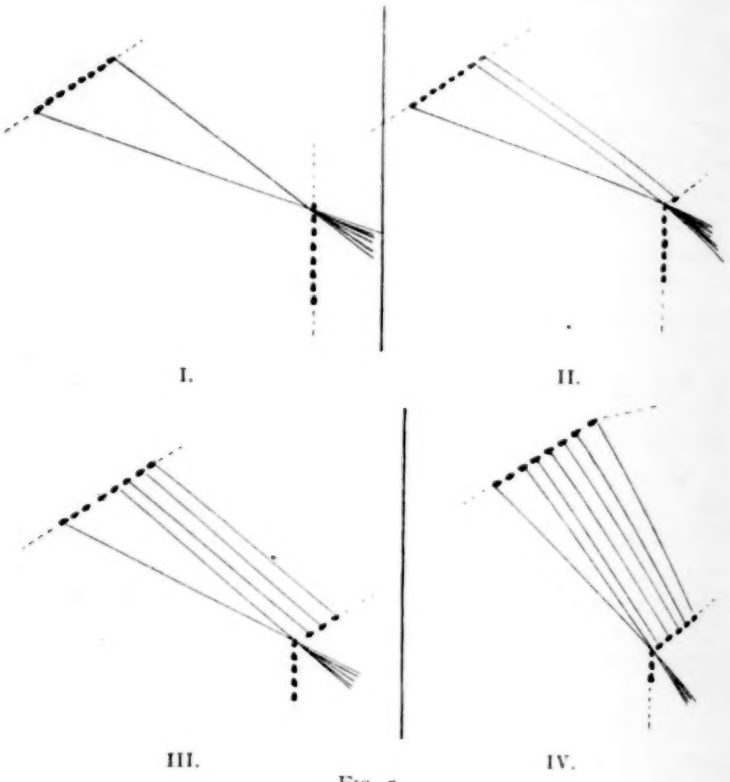


FIG. 5.

Many officers, especially writers on tactics, seem to have the idea that if a fleet obtains the position advantage it can concentrate the fire of all its ships upon the leader of the enemy's column and that this overwhelming fire will quickly put that ship out of action. It has also been claimed that the above use of concentrated fire was proved effective by the results of the battle of the Sea of Japan.

Those who have seen a battleship steam across a target range for eight minutes at 6500 yards, firing all its guns, and fail to record a single hit will appreciate the necessity of accurate sight-bar ranges and the value of efficient spotting. If all the ships of the fleet should fire at this leader, to make sure of even a fair percentage of hits, each ship must keep the range; this is difficult enough when the target is stationary and there are no splashes of shots from other ships to confuse the spotting, how then will it be when the target is in motion and the water about it lashed to foam, the target in fact fairly blotted out by splashes of shells. It was said above that concentration on the leader is uneconomical except when directed on the ships turning in succession to parallel the opposing column. Then the situation is simplified, for the target is stationary and the rate of change of range for each of the concentrating ships will be known for its angle of approach at each instant, or at least the angular bearing of the turning point, which amounts to the same thing. Now in spite of the hundreds of splashes if one good spot can be obtained then the problem is solved; but this would not hold for the leader in motion.

By reference to Fig. 5: I shows uneconomical concentration, in that the percentage of hits will be small . It may be the one choice in this position, but when the leader turns, as it must do, then the logical target is the point of turn, and each ship in column should pick up its opposite as it emerges from the mælstrom; this is shown in II, III and IV.

If I read the reports correctly, this is the concentration made so effective by the Japanese.

A proposed tactical game board.

The outfit to consist of three main features:

(a) The working board.

(b) The visual board.

(c) The spotting board.

The first to be the board as now used in the tactical games with all its accessories.

The visual board to be about five feet square and painted a suitable color to resemble the sea with a bright background against which miniature ships may be seen distinctly. The ships to be in proportion to the scale of the board as they would appear through glasses of ten power. The observer's eye is to be placed at such a position and at such a height as would simulate the admiral in the conning tower of the flagship.

The spotting board to be similar to the one described in "Battle Rehearsals," published in the INSTITUTE last March.

In addition to the outfit of the present game board the following will be needed: Protractors to measure the courses and changes and metal scales to measure the ranges.

Conducting the game.—Each fleet will be commanded by an admiral and have as many assistants as necessary for spotting and fire control. The fleets are to be placed on the working board at a distance of ten miles in whatever formation chosen by the contestants. The moves will be at intervals of three minutes (two and a half if desired). A simultaneous movement must be written and handed to the umpires one move before it may be executed.

The contestants are not to see the working board but after each move the fleets on the visual board are shown them, all angles being carefully laid down (two visual boards appear to be advisable). The ranges and bearings of the leaders are given the contestants, measured from the working board, at every interval until gun-fire begins which data they would have in battle. (After gun-fire begins only the bearing of the enemy.)

Each fire-control officer must give in writing to the admiral and umpires the range used at each interval.

When the opposing fleet is using a range within 200 yards of the measured distance the other admiral is at once informed.

When the shots of either side fall short at the end of an interval by more than 250 yards, the one interested is taken to the spotting board and given one spot to obtain the correct range, this to be applied with the change of range to obtain the range at the next position. If the shots are over by more than 250 yards the spotter is told *over* and he may reduce the range as he sees fit to apply to the range at the next position.

Gun-fire will be measured by the wand as done in the present game except to obtain 100 per cent of the wand value the average range between positions must have been within 150 yards of the distances measured on the working board; to obtain 50 per cent the average range used must be within 200 yards, and to obtain 25 per cent within 250 yards. If over 250 yards no gun-fire will be given.

All rules of the present game which do not conflict with the principles outlined to be retained.

The visual board is the only new feature and it does not present

much difficulty in construction. The ships should be as life-like as possible and the height of the observer's eye accurately calculated and great care must be taken to set the ships in their proper positions so that the contestants may estimate the courses steered. (Lazy-tongs might be found useful.)

The game itself will work out in the same manner as the evolution described and shown in Fig. 4, except concentration may become involved. It may be necessary to form new rules or change the above ones after a few attempts at the game. I offer this only as a crude suggestion for those interested to follow.

After having quite completed the essay it occurred to me that the game as proposed above would necessitate for quick and accurate working some short method of finding the change of range.

This I have done graphically at a range of 6000 yards, the results being as follows:

Bearing of target from bow. Degrees.		Change of range in yards per minute. Speeds.		
		12 knots.	16 knots.	18 knots.
0	Towards-decreasing	400	533	600
10	do	395	515	590
20	do	375	490	562
30	do	345	450	510
40	do	310	400	450
50	do	260	325	362
60	do	190	240	265
70	do	125	155	165
80	do	70	85	90
90	Away-increasing	12	20	50
100	do	88	125	140
110	do	150	200	235
120	do	212	280	325
130	do	270	350	400
140	do	312	415	465
150	do	350	465	525
160	do	375	500	565
170	do	395	525	590
180	do	400	533	600

This was calculated from a stationary target, but to obtain the correct change of range for ship and target both moving one needs only combine the two changes with their proper signs.

In order to be able to do this with greater facility and also to see how the curves would look, I have plotted the curves of the

rate of change of range per minute (in folder enclosed) and from these curves the required change may be picked off quickly.

Example.—Suppose the black fleet at 18-knots speed finds the white leader bearing 70 degrees from her bow and estimates her bearing from white's bow to be the same—70 degrees, both fleets are approaching each other (speed of white 16 knots).

Then on the ordinate at 70 degrees run out to the 18-knot curve, measure distance on dividers then put second leg of dividers on 70, other leg on parallel behind and add distance to the 16-knot curve; this total distance from scale will be 330 yards change of range in a minute (decreasing).

If the angle from black's bow was 70 degrees and white had turned away by a like number of degrees (20), then the bearing of black from white's bow would be 110 degrees; as before measure the distance from 70 to the 18-knot curve and then subtract this distance at 110 degrees from the distance to the 16-knot curve; the result will be 30 yards increasing per minute.

As an afterthought in order to obtain the size of the ships for the *visual board,* it occurs to the writer that the most likely way would be to have made a number of silhouette ships of different sizes pasted on a white board; then take a pair of glasses of fair-size object-glass such as an admiral would use and when opportunity offered send out a battleship to 7000 yards to place herself on a course perpendicular to the observer. Suppose it was desired to have the distance 7000 yards represented on the board by five feet, then place the board with the silhouettes at this distance (five feet) from the observer's eye and have him glance through his glasses at the battleship and then down at the silhouettes until he has decided which is the size that will give the realness desired.

What effect has the torpedo upon naval tactics?

The successful use of the torpedo in a naval war to a greater extent than any known weapon will depend upon the efficiency and bravery of the personnel. In the hands of daring and skilled men it may decide the fate of a nation but in the hands of those who have not learned its idiosyncrasies and also lack the dash and daring of initiative it is next to harmless.

As an offensive weapon it has been installed in the heavy fighting ships to prevent a faster enemy from attempting to close to such a range where superior fire skill would be nullified; thus giving up an advantage gained by constant target practice. It finds

its place on board armored cruisers and scouts for similar reasons, and still on destroyers to enable them to be used at night or in foggy weather against the large fighting units of the enemy. To the submarine it is the one weapon of offense after it has stolen to within striking distance.

The question before us is: How will the fear of the torpedo influence the tactics of the fleet in battle tactics?

The destroyer need not be considered in battle tactics by either fleet until gun-fire has so badly disabled one or more units that the crippled vessels must perforce be abandoned by the main fleet else the whole fleet will at once place itself in an unenviable position for concentration of its enemy's fire. Here destroyers will find their field and in order that they can operate in most weather they should be sufficiently seaworthy—the latest foreign destroyers are of over one thousand tons displacement.

The exploits of the *Hirose* and *Sudzuki* destroyer flotillas in the battle of the Sea of Japan are of too recent occurrence for us to soon forget. Admiral Togo gives to their credit the sinking of the *Souvaroff* and if the truth were known many more of the ill-fated ships of the Russians were mortally wounded by these fearless vessels.

The submarine.—It is the opinion of the writer that these vessels are not being given the serious attention which they merit. From a cursory inspection one is apt to think that their use will be only for defense. Developed as they are in our navy they do not strike one as being capable of accompanying the battle fleet. That this feat would be surrounded with many difficulties and dangers is evident, but even so we must not hesitate. The vital question is: Can the submarine of the latest type accompany the fleet? Not under their own power but in tow of the fighting ships. Ask the submarine officer: I firmly believe his answer will be in the affirmative. If this is feasible now it goes without saying that it will be done in war. Shall we wait until that time before we find the true destiny of these weapons? To test their capabilities the crews will be subjected to some risks but training for battle must of necessity include risks.

The methods by which the fleet accompanied by submarines can use the latter to a tactical advantage will only occur to the service after we have commenced to consider them as weapons of war instead of expert toys upon which to build theories.

Supposing that the above is possible, the first point that presents itself is that the faster fleet (not having submarines) can draw off and refuse battle if it fears the enemy's submarines, but if the conditions were reversed (the faster fleet having submarines) the slower fleet can not, and the faster can force the slower to

FIG. 6.

pass through water guarded by its submarines; if the slower fleet endeavors to avoid this dangerous water it will lose in position equality in so doing.

This point is shown in Fig. 6:

The black fleet is shown to have a speed of 18 against the

white's 16 knots and to be 10,000 yards apart. The lines (Fig. 6) are drawn to show the courses and distances to be travelled by black's submarines in order to place themselves in position to strike the white fleet. As the present speed on the surface of these weapons is 11 knots and as a great part of the run may be made on the surface it will take them 8 hours to reach the position desired.

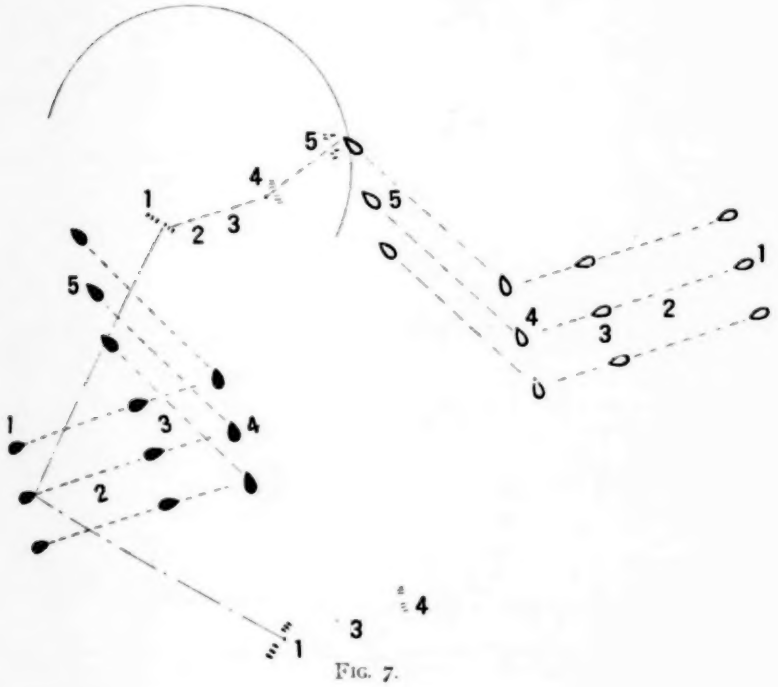
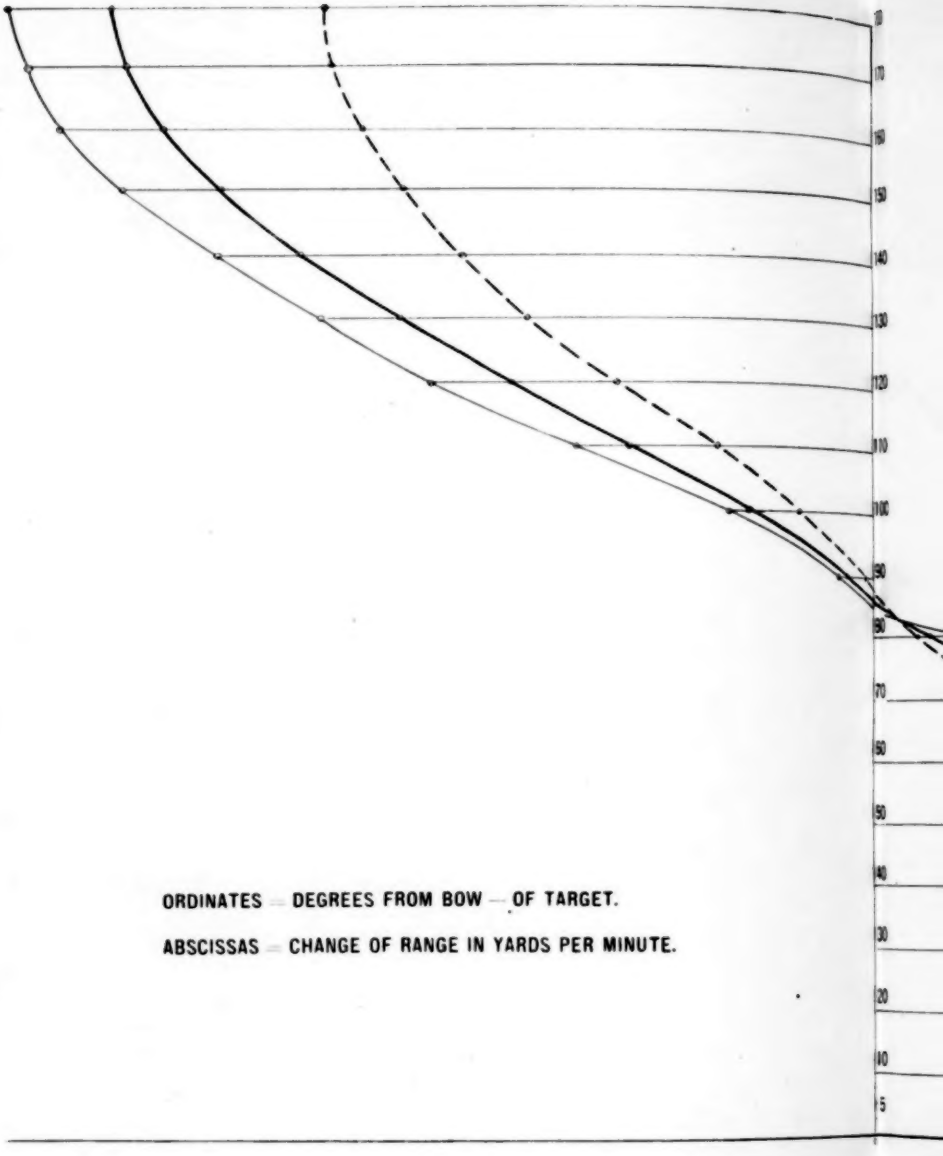


FIG. 7.

It might be said that long before 8 hours the battle will have been decided and therefore it would be wiser to hold the submarines near the fleet. This is of course sound, for inside of 8 hours darkness may intervene, and yet on the other hand it may be the faster fleet's one chance for success for reason of inferior gun-fire, armor protection and fire skill or it may have fewer ships and daylight permitting may wish to delay the battle to allow its submarines to even up with their torpedoes.

There is another method for the offensive use of the submarine. The fleet having these vessels can station them in groups on


ORDINATES — DEGREES FROM BOW — OF TARGET.
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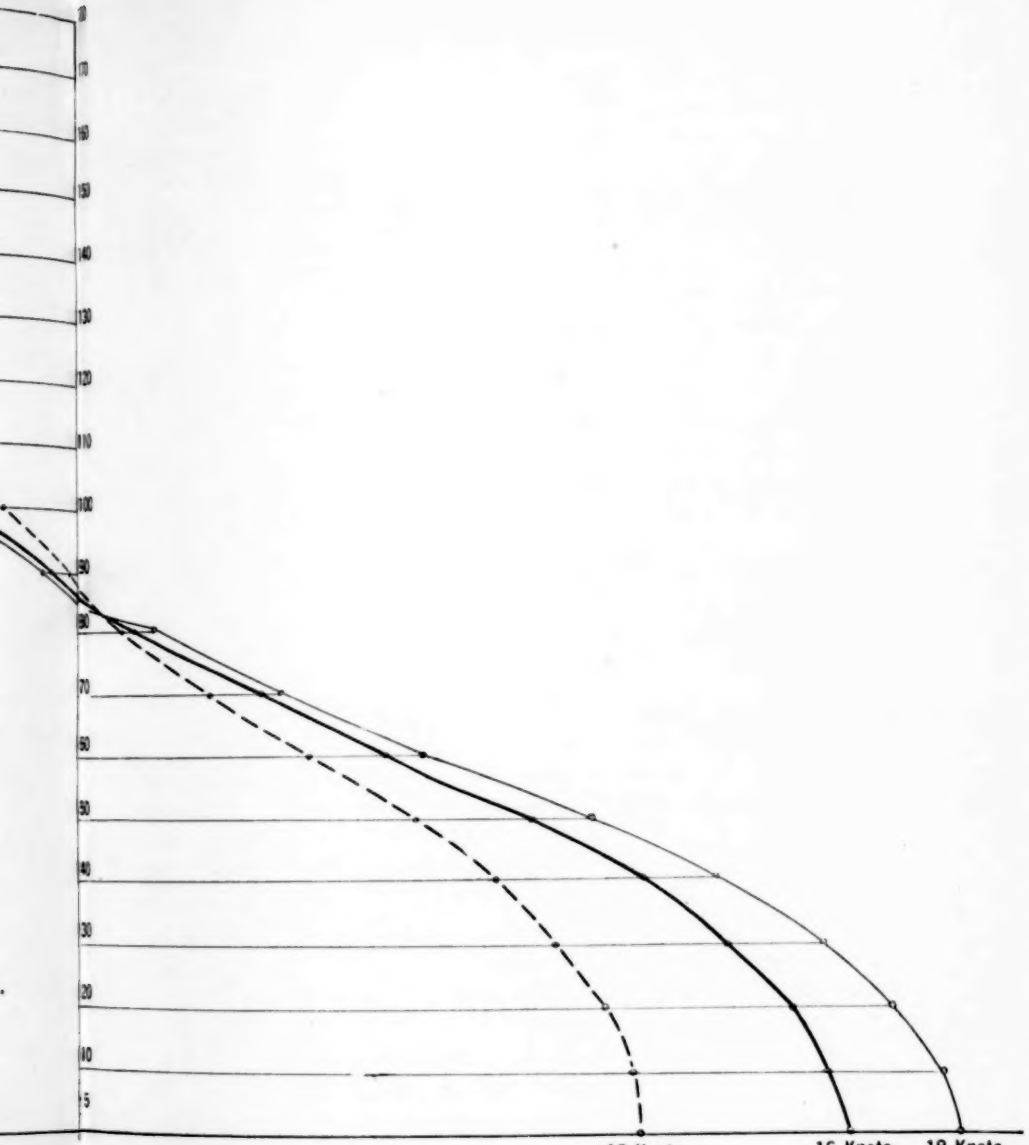

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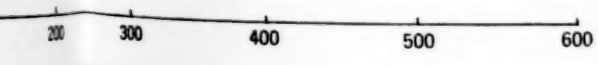


SCALE OF YARDS.

bearings, four or eight points apart, from itself and in the direction of the enemy as known from the messages from scouts. This is shown in Fig. 7, their distance from the fleet being approximately battle tactics. The submarines steaming on the surface to be ready to submerge at the approach of the enemy. These positions could be taken by the submarines more accurately when the fleets are at distant touch. As shown in the figure, whichever way the enemy turns, unless away, the submarines would find themselves within striking distance.

As yet we know of no defense against a submarine save speed and an invulnerable underwater body, and the latter seems far removed from the present. In battle, while all attention is absorbed by handling of the ships, signals from the flagship, fire control and gun-fire, might not a submarine with but its perescope above water or in using porpoise dives to follow a course to intercept be a dangerous foe.

This *porcupine method* may be varied to suit the circumstances, but until we use these craft in really serious work we shall not be able to judge how far we ca.. go, and what is worse we shall remain uncertain how far our possible antagonists may have developed them.

As an example, imagine the feelings of an admiral:

He sights the enemy and forms line at right angles to the battle front. Approaching at best speed he sees upon closing the distance that the enemy is in the same formation. When the range is about 9000 yards he sees his antagonist turning into column and does likewise; then the enemy executes a simultaneous turn of 40 degrees away, and nothing daunted he turns each of his ships through the same angle. Then suddenly close aboard a white streak of disturbed water or the break from a porpoise dive gives him the clue to the enemy's tactics. Meanwhile his fleet sweeps on with these deadly vessels in its path. Or suppose the fleets had approached within gun-fire range before the enemy had made its turn away and the enemy's shells were striking around the admiral's ships then the *evident signs* might not have been so readily observed.

The least that can be said for any method of trying the submarines offensively is that it will accustom the personnel of the big ships to recognize them in attacking.

DISCUSSION.

Captain B. A. FISKE, U. S. Navy.—It seems to me that Mr. Stirling's essay combines in an unusual degree the elements of thoughtfulness, originality, and good literary diction.

Almost all of the ideas of Mr. Stirling seem to me to be extremely good. Especially fine are his remarks about the treatment of the enlisted man, and his archaic uniform; and the proposed method of drilling the fleet. In regard to torpedo boats, while agreeing with the essayist, I do not quite see why it would not be better to have one or two big torpedo ships, instead of a lot of little half-seaworthy destroyers. In regard to the submarine, Mr. Stirling dramatically opens a large field, and one which surely will be well explored before long.

Mr. Stirling's exposition of how easy it will be in battle to fool the range projector by changes of course too small to be apprehended by the enemy, is respectfully commended to the attention of those who favor the ascertaining of the correct sight-bar range by observations from aloft alone.

On only one point do I find myself in radical disagreement with Mr. Stirling, and that is, the point as to where our fleet should usually be based. I appreciate thoroughly the numerous and important advantages of having the fleet in the Pacific; but let us not forget that a battleship is not only the most powerful machine in the world, but one of the most progressive; and also that it is effective, *per se*, in proportion as all its mechanisms are not only kept in order, but *kept up to the times*. The personnel must of course be trained to the highest point; but progress in this direction is limited by the limitations of poor human nature. The battleship, however, regarded as a machine, is capable of great improvement; and every improvement can be improved upon. For instance, the effectiveness of every battleship in our fleet would be increased at least 25 per cent by substituting good conning towers for those they now have, and these good conning towers could be improved as time went on. One of the greatest causes for the success of Andrew Carnegie was the extraordinary quickness with which he adopted every improvement that came along. It is said at one time he practically junked $700,000 worth of new buildings and furnaces because he found that he could build better ones. If his plant had been away from the great centers of engineering and invention, he could not have adopted improvements continually and would be a poor man to-day.

Now the great centers of engineering and invention in the United States are on the Atlantic coast, not the Pacific. And while it is true that our ships would not go to ruin on the Pacific coast, it is sure that we shall never be able to keep them right up to the top notch of modernity, as regards the appliances of engineering and invention, except upon the Atlantic coast.

Lieut.-Commander A. B. HOFF, U. S. Navy.—The main part of the essay is "range movements" in battle tactics.

This attractive maneuver was first brought to my attention by the gunnery officer of the *Admiral Aube*, during one of the burials of John Paul

Jones. His explanation seemed sound, yet not altogether so. Such movements I believe to be subject to the following disadvantages:

(1) How do you know that you are faster than your enemy? The essayist agrees this knowledge must precede range movements.

In a parallel engagement it will take 15 or 20 minutes before you will feel that this is apparent. One would certainly be foolish to lose position through range movements before trying out the speed of your antagonist.

By keeping enemy's leader abeam, at 10,000 yards, you find that in 10 minutes you have your opposite number half a point to the bad. This would mean a speed of three knots better than the enemy.

Now half a point is a small amount, but still it can be accurately measured on a compass, and would be indicated by your course having changed half a point *towards* your enemy.

This would not be apparent, probably, till twice this time had elapsed, or twenty minutes. In this time considerable damage ought to be done to both sides. Signalling by that time will be seriously affected (using present methods).

Range movements require the precision of fleet drill to be accurate, and complete ability to signal and receive signals.

Can they be undertaken with a 16-ship column after 20 minutes' fighting with our present methods?

"Position" movements, on the contrary, are automatic.

With our new masts and shapes, or with shape balloons, we may probably accomplish ability to signal under such circumstances.

However, we have no new masts afloat; we do not use shapes for battle signals; we have not developed balloon signals; we have no admiral's conning-towers from which signals can be sent out and received; and our ship's conning-towers are a long way from perfect. So we are some way from even the ability to execute range movements after 20 minutes of battle. This, however, does not yet change the soundness of the essayist's theory.

(2) Next, as to "spotting": It is undoubtedly true that a fleet ranging towards an enemy will have the shot falling over and hence be baffling to spotters.

However, there will come a time when they must retrace their steps or go parallel, and hence the advantage will be the other way.

If the slow admiral can follow the fast admiral in his range movements, then the latter's advantage disappears on account of his turning, yawing, and turning again, all under fire; his liability of deranging his line; and the necessity of swinging back into column at the end of his range movement.

(It is supposed that on signal for a range movement the angle toward the enemy and the duration of the movement would be prearranged.)

It is undoubtedly a great desideratum to accurately measure movements of ships in fleets. The "nautical" eye at modern ranges for this purpose is useless.

The Battenburg indicator, the mooring board, range finder, telescoped stadimeter, and the range projector, give results that the "nautical eye" can never obtain.

"Tracking" the enemy, as is done by the artillery corps, in a manner somewhat similar to that described by Captain Fiske in the March PROCEEDINGS, must take the place of guess work, and must be used by admiral, captain, and fire control, to direct the fleet, set range clocks, and fight the guns.

By use of accurate methods, an admiral has then some information. Otherwise he has none.

With a proper admiral's conning-tower and tracking room (in the bowels of the ship and directly under the conning-tower); and a powerful telescope in a stadimeter, so as to get the rate of approach and retreat of the enemy, range movements of a fast fleet ought to be met on more than equal terms by a properly equipped "slow" admiral.

To sum up range movements:

a. They cannot be taken unless you are certainly faster.

b. You cannot be sure of superiority in speed at the initial stages of an engagement.

c. Your superiority in speed may lapse during range movements, to your "position" disadvantage.

d. Your range and deflection spotting will be thrown off during the range movement, due to the initial turn; the yawing and speed regulation of keeping on a line of bearing, and the final turn again into colum.

e. The movement will not baffle an enemy well equipped with a "tracking" system.

f. The derangement of the battle line of a fleet executing a range movement, due to damage to its units, may make it a difficult matter to straighten out again into column.

g. If speed is lessened during range movements—due to such damage—"position" is lost.

h. An accurate steering device or compass is a necessity.

The question is, do these considerations overcome parallel fighting and straight shooting when both antagonists are equally skilful and equally well equipped, and vary only in gunnery?

The game proposed by Lieut.-Commander Stirling is certainly most ingenious. It seems to embody the things that should be assiduously practiced by every fleet.

The chief points noted are, that neither side is allowed to "feel" the distance by spotting—they do not know they are "off" till told so. Does not this practically eliminate spotting as a battle factor in this game? Again the visual board introduces the uncertain methods of the "nautical eye"—when more certain methods are at hand.

I believe with a good telescope on a stadimeter the *rate* of approach can be pretty accurately determined, through a slit in the conning-tower.

Excellent results at 6000 to 8000 yards have been obtained already by this method in battle maneuvers.

The true use of concentration is undoubtedly that of Tsushima, as pointed out on page 413. Certainly concentration on equal terms is an exploded theory.

The gyroscopic or electric compass seems to have great advantages over the compass placed below and showing into the conning-tower through prismatic reflectors.

I still believe the slow speed of submarines would preclude any such uses in battle as set forth by the writer.

Our insignificant numbers in this type do not allow extensive maneuvers. But there is only one way to learn; and that is, as the essayist points out clearly, by trial.

Lieut.-Commander Stirling should be congratulated on his persevering endeavors to point out what direction *practical* fleet work should take in preparation for battle, and in doing so he clearly shows what deficiencies in material and equipment we are suffering under—deficiencies that are clearly seen and pointed out years before being adopted. What is the reason?

WAR ON THE SEA.—Continued.[1]

CHAPTER V.

The War Between Russia and Japan.

In devoting a whole chapter, and an important one, to the study of the Russo-Japanese war, I have not merely yielded to a very natural desire to examine events which are so much the more interesting on account of their recent occurrence. I have been particularly led to do so by the firm belief that this war abounds in *experimental* lessons in strategy and tactics, that it is also valuable for its numerous teachings regarding errors to be avoided, and that for divers reasons it demanded an examination in detail.

So far as the errors are concerned, we can say at once, even before an actual examination, that the number committed by Russia was beyond measure.

In the night of February 8-9, 1904, Japanese torpedo-boats attacked the Russian squadron anchored in the outer harbor of Port Arthur. This beginning of the campaign, as savage as it was deceitful, without preliminary declaration of war, might well surprise and afflict sensitive souls; yet, in the logic of events, it was the natural consequence of the Japanese temperament and the English education of their navy.

This carelessness on the part of the Russian sailors, their absolute neglect of the most elementary precautions in the matter of watchfulness, in the midst of a time of political tension, despite the suggestive warnings of English naval wars, have everywhere been charged against them as a grave fault which weighed heavily upon all their succeeding operations.

Their lack of care, undoubtedly blameworthy, dear as its cost to Russia was (for by the putting out of action of two battleships, the *Cesarevitch* and *Retvizan*, and the protected cruiser *Pallada*, she found herself from the start in a condition of undoubted inferiority), is nevertheless only a fault of detail, only a single term, among many others, in a long series of errors of the Russian

[1] The conclusion of this work will appear in the next number of the Proceedings.

policy, which can all be classed as the result of an absolute lack of understanding of the preponderant importance of naval preparation for war with Japan.

THE POLITICAL STRATEGY OF RUSSIA.

The first of the series of errors occurred ten years before, when by her lease of Port Arthur, followed by the invasion of Manchuria, Russia inaugurated an active policy of expansion in the Far East.

From that moment, for two chief reasons, a war was inevitable, sooner or later, between Japan and Russia.

The self-esteem of Japan, a new recruit to Western civilization, and so much the more sensitive that her initiation had been rapid and was of very recent date, could not pardon her dispossession by the allied forces of Europe of a naval base which she believed to be her own by right of conquest. The time was to come when the beneficiary would have to bear the consequences of this resentment. When there is added the uneasiness which the encroachments of the great Russian Empire upon Chinese soil could not fail to provoke, and that Empire's constant approach to Korea, for centuries the object of the desires of the Empire of the Rising Sun, the probabilities of this war must appear numerous in the eyes of the most sceptical.

In stating this, I am taking into account the aspirations of her people. I know very well that, even at the beginning of the year 1904, no one thought there would be war, any more in Japanese governmental circles than in Russia. By a very curious coincidence, two days after the night attack at Port Arthur there was given to me to read a letter just come from the Far East, written consequently a month before the opening of hostilities, by a person well situated to know the sentiments of the Japanese authorities, and in which the opinion was clearly expressed that only in Europe could anyone believe that a conflict was possible. The proximity of date of the reception of this letter and an event so decisive as the torpedo-boat attack is suggestive of consummate irony.

They had forgotten, in the Far East, that there are many instances in history where the current of a superexcited public opinion, stronger than all the combinations of diplomats, recognizes no obstacles, hurries on governments impotent to resist and bears nations irresistibly towards inevitable encounters.

From the very beginning of the policy of expansion, then, it was necessary to prepare for war carefully and decisively. And this was so much the more needful because, though the repeated military successes of the yellow race are to-day a revelation for the immense majority of Europeans, accustomed to regard all the nations of Asia with the same contemptuous disdain, they should have been no surprise to all those who, scarcely twenty years ago, had opportunity to compare the warlike ardor of the Japanese with the submissive inertness of the Chinese, even in the most trivial affairs.

Russia to-day is paying the penalty of this capital fault of not understanding the pressing necessities to which her policy of expansion condemned her, a fault before the act as it were, and one compared with which all the others committed after the opening of hostilities, *although they derive from the same false principle,* are yet but of secondary importance. To make clearer my idea, I will say that Russia is now bearing the consequences of a fundamental error of strategy which from the beginning involved the fate of her arms and in advance marked her for defeat.

The question is worth pausing to consider, for unhappily Russia is by no means the only power in the world which has neglected this great duty of preparing for war which every far-sighted and strong nation fulfils along with a policy of expansion.

To found colonies, and to sow in them with liberal hand the riches which enhance their value, without developing *at the same time* the means of protecting them from the covetous, is to play the part of dupe and to work for others.

From the moment that the lease of Port Arthur was signed it was therefore urgently necessary to prepare for war with Japan, and the period of nearly ten years which followed would certainly have sufficed to secure Russia such a preponderance that the classic proverb would have once more proved true and peace been assured.

This being granted, how ought this war to have been prepared for? Here the problem becomes definite. For those who firmly believe that in the teachings of the military history of the past there are to be found laws and lessons from which modern wars can profit, this preparation must be above all and almost exclusively naval.

The future adversary was, in fact, an insular nation, and al-

though undoubtedly possessed of a strong army, this could only act by the efficient help of a powerful fleet, and one so much the more powerful as, its base of operations being beyond the seas, the condition necessary to its success rested on the retention of command of the sea.

Therefore it was necessary to be prepared to strike decisively at this navy. And such was in very truth the set problem. Let us suppose it for the moment solved, that is to say let us imagine that Russia had, at the beginning of 1904, in the seas of the Far East, a superiority of naval force, incontestable and admitted, over Japan. The disembarkation of the Japanese armies upon the Korean and Manchurian shores would have been perfectly impossible; and, if reason is insufficient to compel conviction upon this point, the teachings of the past furnish arguments beyond dispute. The study of our centuries-long struggles with England is particularly profitable in this regard.

While invasion of England by French forces has been an exceptional event in the course of naval history, the descents of the English upon the soil of France have been extremely numerous. In the one case, as in the other, these operations of invasion have always been carried on by that one of the two nations whose fleets were in command of the sea.

For if, from 1377 to 1385, with Admiral Jean de Vienne, several descents upon the British Isles could be successfully executed, it must not be forgotten that this was owing to the genius of that great seaman, who first in France was able to understand the exceptional value of dominion over the sea and to conquer it by profiting by the momentary eclipse of the English naval power.

It is thus, thanks to their uncontested superiority upon the sea, that the English were frequently able to make landings upon our coasts, and even to retain guarantees there for so long a time—Calais, Dunkirk, etc.—which it would have been impossible for them to hold without the support of a fleet which was sovereign mistress of the maritime avenues of revictualment and re-enforcement.

It was from the absence of this indispensable condition that all the projects of invasion of England, conceived in the reigns of Louis XIV and particularly of Napoleon, could have no chance of success.

Egypt was virtually lost to France after Aboukir.

In our own days, if Great Britain can continue to regard as a useless luxury the organization of an army whose function it would be to safeguard her territory, it is because she has full consciousness that her formidable fleet constitutes for her the most invulnerable of protections. Quite recently indeed, the Prime Minister, replying to a question in the House of Commons, rejected as a quite impossible hypothesis the invasion of England, so long as the English naval forces dominated the sea.

It may be said, therefore, that a military expedition *beyond seas* cannot be successfully carried out except with the *previous* condition of freedom of the sea.

Thus that which contributes to the strength of England and of Japan, their insular situation, is also their weakness in the case of a war of conquest. And so it was the Japanese navy, above all, that the Russians should have thought of holding in check.

But from 1894 to 1904, that is in ten years, the Russian navy gained twenty-one units, namely: eighteen battleships of a total displacement of 199,800 tons and three armored cruisers altogether of 33,000 tons. And as a matter of form I mention 58,500 tons of so-called protected cruisers, which are not counted as fighting ships.

If a mere comparison of figures were to be made, perhaps the Russian effort could be thought acceptable, since in the same period the Japanese fleet only gained fourteen fighting ships, of a total displacement of 160,000 tons. But so superficial a method of valuation can lead only to gross errors, since it takes account neither of the quality of the fighting units nor of their personnel.

While the Japanese built the four fifteen thousand-ton battleships of *Shikishima* type, which by themselves alone represented a considerable power, and the seven armored cruisers of *Asama* type, to which were added, before the war was declared, the *Nisshin* and *Kasuga*, bought from Ansaldo of Genoa, all similar modern units, constituting a formidable homogeneous force, the Russian Naval General Staff laid down successively a number of far too unlike types, from the *Admiral Oushakoff* to the *Cesarevitch*, no one of which came near to equaling in value the powerful Japanese units, and finally three armored cruisers having very few points in common, the *Rossia*, the *Gromoboi* and the *Bayan*.

In this absence of continuity of ideas, of any fixed principle in the matter of new constructions, in these too numerous trials of

different models, a new proof must be seen of the Russian government's lack of understanding of the greatness of the part which its navy could and ought to play in case of war with Japan.

On the sea, even more than on land, combinations of heterogeneous forces are not conducive to victory, and command of the sea cannot be maintained with a naval museum of samples.

The Russian effort during the period of incubation of the inevitable hostilities will appear still more insufficient when it is remembered that, besides the new requirements of their Asiatic expansion, the Muscovite diplomacy had to take account of their ancient interests in Europe, of their preponderating rôle in the Balkan peninsular, of the jealousies of Germany as well as of England, all causes which imposed upon them a strict obligation to maintain a powerful navy in home waters. The Japanese policy, for its part, on the contrary, had as sole field of operations the seas of the Far East.

If to govern is to foresee, it is therefore quite exact to say that the Empire of the Tsars was badly governed, since it did not comprehend that the constitution of a powerful fleet, which, in the ten years' respite at its disposal, it could easily have formed of eighteen fighting units of the first class, would have been a great economy. This imposing and homogeneous force would have sufficed to calm all the belligerent ardor of Japan, and would thus have prevented the mad squandering of money and of human lives which the war entailed.

The needful effort would have required an addition to the special budget of expansion in Manchuria of an annual supplementary credit of from one hundred to one hundred and twenty millions (francs); that would not have been beyond Russia's means. It represented the premium on insurance that progress towards the East should continue and that an ice-free sea should not be put out of reach. The parsimony with which the Russian General Staff treated its naval force, in its ignorance of the preponderating services which common sense strategy assigned to the navy, can be recognized by another sign.

If, at every period of naval history, fleets have had pressing need to secure "advanced bases," centers for laying up, revictualing, etc., where the ships can go to be repaired, to get new supplies, or even merely to rest, above all during the winter, from the

fatigues of long cruising, never have these " bases of operations " been more indispensable than nowadays.

When the wind was the only moving force, a fleet well provided with food and ammunition could, if need there were, keep the sea for long months, at a pinch even put in to port on a foreign coast. It is thus that our great Suffren, in his immortal campaign of the Indies, remained away from Reunion, his only friendly port, during twenty-two consecutive months. I hasten to recall, furthermore, that he would have had no rest if he had not conquered the advanced base which he lacked, which he accomplished by capturing Trincomalee.

In our time, needs of this kind are infinitely more pressing. Though modern ships of war carry enough food to suffice for the nourishment of their crews for several months, on the other hand they only hold the coal necessary for the maintenance of propulsive power for a few weeks, one may even say a few days. The obligation to return frequently to port for fuel is therefore imperious. Moreover steel hulls in sea water become covered with grass and barnacles; under penalty of seeing the high speeds which are a strategic factor of the first importance greatly reduced, periodic visits to a dock are necessary.

Thus far I have considered only the exigencies of the daily life of fleets. What must there not be added, when one thinks of the needs entailed by bad weather, of the repairs of all sorts necessary to restore to fighting trim the ships composing a naval force which has been in battle, *even if victorious.*

Modern bases of operations, therefore, require considerable supplies of provisions, ammunition, coal, lubricants, spare articles, raw materials, etc., dry docks, repair shops well equipped with tools, etc., all under the safeguard of defences which cannot be too strong, since the question is to guarantee the security of the preparations of naval operations.

Remember that it was much more from the almost complete lack of means of action of this sort than from the individual weakness of his ships, that Admiral Cervera's unfortunate squadron perished at Santiago de Cuba; for his four cruisers would still have been able to play a good part if they had been *active,* if they had been provided with the things most essential to their very life.

What we know to-day of the events of the Russo-Japanese war permits us to believe that, at Port Arthur as well as at Vladivostok,

none of those judicious arrangements which indicate a wise and farsighted preparation for war had been planned and executed.

The damages of the *Cesarevitch,* of the *Retvizan* and of the *Pallada,* in the unexpected Japanese attack which gave the signal for war, could only be repaired by improvised means. This was a demonstration of the poverty of naval resources at Port Arthur. The subsequent events of the war furnished a later occasion to see that Vladivostok was not much better provided.

The characteristic of this war, so far as the Russian side is concerned, is truly then the lack of prevision of the primary part which was to fall to the navy to play. Nothing can be improvised in war, to-day less than ever, and proper preparation for it takes a long time.

It is because of having ignored these essential truths that Russia pays penalty to-day; that great and unfortunate nation had no faith in her navy, she did not understand that by itself it would be the best guarantee of her policy; she pays dearly for that initial error.

"*No colonies without a navy,*" said Napoleon on the occasion of the cession of Louisiana. A striking truth, to be constantly borne in mind, and particularly applicable to the case of Manchuria. And this error on Russia's part was so enduring that even after the war had begun she had no perception that from the navy alone could her salvation come.

To the strategical errors of the government are to be added those of the chief command. How really can the strange carelessness which exposed the Russian fleet to the night attack of February 8 be less severely spoken of? It was already too much when, in the full period of political tension, war ships rested each night in careless and complete quietude in the outer harbor of Port Arthur; the continuation, after the breaking off of diplomatic relations, of such dangerous misconduct, which exposed valuable fighting units to the chance of a possibly total destruction, is inexcusable.

A striking comparison enables us to foresee what henceforth are to be the very different methods adopted by the adversaries for the conduct of the war. On the side of the Japanese, whose sailors are brought up on English naval doctrines, there will be the bold and energetic offensive, the sudden attack which disconcerts and demoralizes the enemy, in a word the method of which the applica-

tion has given victory to the great captains of all ages, Alexander, Cæsar, Hannibal, Napoleon, Suffren, Nelson.

In the Russian camp, on the contrary, there will be adopted a timorous defensive, a passive attitude of waiting, a depressing inactivity, and, to say all, the system which has brought upon us Frenchmen our most grievous naval defeats from the battle of Sluys to Aboukir and Trafalgar.

Moreover the choice of Port Arthur as the point of concentration of the Russian naval forces was not a happy one. The hydrographic conditions of that port were hardly suited to the establishment of a principal advanced base or base of strategic operations; the inner harbor too small to shelter a fleet; no safe outer harbor insuring to a squadron at anchor perfect and absolute security; absence of any outer roadstead in which a fleet could form in order of battle under the protection of defensive works; difficulties of organizing the naval defence; possibility of closing the entrance; finally a situation at the end of a long and narrow peninsular, exposing it to attacks from the rear; all these unfavorable conditions were more numerous than should have been necessary logically to compel the commander-in-chief to chose Vladivostok instead of Port Arthur as a base of operations.

Another still more important disadvantage to be mentioned is the eccentric position of the second of these two ports relative to the Sea of Japan, the probable theater of war.

Beyond doubt the ice blockade of the great Siberian port, during the severest months of the winter, made it apparently the inferior, I say apparently, for this fault was attenuated by the presence of the ice breaker *Ermak;* but, on the one hand, this relative immobility would only occur during a short period when the excessive rigor of the climate of necessity interferes with all operations of much scope, and, on the other hand, the blockade by the elements was, during this period, the most efficacious of safeguards against a blockade of a different nature.

Vladivostok moreover offered many advantages which Port Arthur was without: a large fine harbor, numerous exits, facilities for defence, many means of replenishment by railroad, highways, etc., difficulty of investment by land, and finally a position at the very center of the theater of war.

It is not alone in the objectionable choice of the point of concentration of the naval forces that a strategical error on the part of

the Russian commander-in-chief appears; another is to be found in the very incompleteness of this concentration. The strict obligation to secure the assemblage at a given point of *superior forces*, should have forced upon the admiral the resolution to gather under his flag all the ships present in the Far East. The isolation of the *Varyag* at Chemulpo, there to succumb with glory but to no purpose; and that of the *Rossia*, the *Gromoboi*, the *Rurik* and the *Bogatyr* at Vladivostok, are not in accord with any military idea. Did the commander-in-chief of the Russian fleet have even one single military idea? We may well doubt it.

I have thought it useful, before any analysis of the actual events of this war, to set forth the initial errors which from the very beginning inclined the balance of fortune, for, in my opinion, no other method would have so clearly revealed the lessons which pertain to our special line of investigation.

Although we have not yet summed up the philosophy of the general doctrines of military history, the preceding chapters have sufficiently familiarized us with certain fundamental ideas to make me think myself authorized to preface the narrative of events by a critical review of initial conceptions.

The great moral bearing of the facts will be only the better understood.

Nor must we expect to find on the Japanese side, during the whole course of this campaign, the evidence of a profound mastership in naval affairs; there was far from being any revelation of a man of genius, and it may be said that the striking successes of the Japanese sailors were much more the results of the incapacity of their adversaries than of the special excellence of their own admirals.

But in all justice we must recognize the latters' merit of having always known what they wanted and having pursued it with energy and determination. Thanks to these qualities of the first rank, powerfully aided by a preparation for war which, contrary to that of their enemies, was marvelous in its method and logic, they won the victory.

The example is all the more striking for us, because it affords a new proof of the preponderant influence upon success exercised in our days by patient and methodical preparations in time of peace, as well as of the possibility of winning success without of necessity possessing any *great man*.

THE JAPANESE OFFENSIVE.

The surprise of the night of February 8 finds its justification on the side of the Japanese in their anxiety to destroy, to their own profit, as quickly as possible, the balance of naval forces in the Far East. This result, by assuring to them control of the sea, alone could permit them to disembark troops in Korea with all the conditions of safety which comport with such an operation. Freedom of the sea was therefore, for the Japanese navy, the *principal objective.*

They secured it, in fact, from the first day of hostilities, thanks to their vigorous attack, and this in spite of the relative non-success of that attack, for the Russian fleet was from that moment reduced to five battleships, *Petropavlovsk, Sevastopol, Peresviet, Pobieda, Poltava,* and five cruisers, *Bayan, Askold, Diana, Boyarin* and *Novik,* of which the first alone was armored; a condition of undoubted inferiority with regard to the principal Japanese forces, which constituted two squadrons, the first of six battleships and the second of an equal number of armored cruisers.

I have said relative non-success. It is in fact difficult to explain, otherwise than by the inexperience of the personnel of the Japanese destroyers, how a surprise attack, made at night and with a smooth sea, upon a squadron at anchor in an open roadstead, without lookouts, and to such an extent undefended that watch is being kept as in times of peace and the assailants are taken for Russian torpedo-boats, did not give results more decisive and more complete.

But, it may be asked, were not the destroyers of a type too big for the mission confided to them, which required a handiness and manœuvering qualities that are combined to a much higher degree in torpedo-boats? It would be extremely valuable to be informed upon this important point, but exact knowledge of the facts is wanting. All we know is that the ten destroyers which took part in the attack fired twenty torpedoes, only three of which made hits. Taking into account the exceptionally favorable circumstances of the attack, such as cannot reasonably be expected to occur again, this result is poor.

Putting aside the *Cesarevitch,* on account of her special construction and her particular system of protection against torpedoes, the performance of which appears at first sight to be promising, the injuries of the *Retvizan* and especially of the *Pallada,* merely

a protected cruiser, are out of proportion to the explosive charges of the torpedoes which struck them. Judging from the experiments made in France and England, upon caissons representing sections of the hull of modern ships, these two vessels should have sunk.

Precise information is lacking to explain this anomaly. Must it be attributed to the nature of the charge, very probably of melinite, as the beginning of asphyxiation felt by several men on the *Pallada* after the explosion seems to show?

The one certain lesson, incomplete though it be, that we ought to derive from this attack is the very grave influence of the practical experience of the personnel upon the success of such enterprises. They require infinitely more of it, in fact, than any other undertaking whatever that occurs in naval wars.

There appears to have been altogether too little practice with torpedo-boats in most countries; and I do not hesitate to find in this circumstance the explanation of the quite insignificant part played by them, on both sides, in the course of this Russo-Japanese war.

I dwell upon this point; because only a few years ago, at our school for torpedo-boat officers, night firings were very considerably reduced in number, for the single purpose of avoiding losses of torpedoes. This strange conception of preparation for war needs no comment, for such an economy of old exercise-torpedoes may, some day, cost very dear.

On the next day, February 9, the Japanese fleet made its appearance before Port Arthur; it was the logical consequence of the attack of the preceding night and the first effective manifestation of the command of the sea by the Japanese.

Before anything else the latter endeavored to attain this principal objective, and they attained it by coming, on the opening of hostilities, to blockade in their place of refuge the forces of their adversaries. Thus they showed their understanding of the true principles of war, and they gave a second proof of it by the rational composition of their fleet.

That which presented itself before Port Arthur was divided into three main groups, the first composed of six battleships commanded by Admiral Togo, the second of six armored cruisers under the orders of Admiral Kamimura, and the third of five protected cruisers under the flag of Admiral Dewa. It is impossible

not to see in this arrangement a faithful application of the principle of homogeneous forces. We shall see in the course of events that the Japanese respected that principle knowingly, and as rigorously as possible.

THE EVENTS AT CHEMULPO.

The events of February 8 and 9 before Port Arthur were intimately connected with other operations of which Chemulpo was the scene at the same moment. The severe cold, by limiting the number of landing points not blocked by ice, and moreover the need of securing from the beginning of the war the submissive support of Korea and of the Korean government, indicated this port as the initial place of invasion of the first Japanese troops.

On the evening of February 8, the Russian gunboat *Koricits* sailed from Chemulpo to join the fleet at Port Arthur. Just outside she comes upon a flotilla of four Japanese torpedo-boats, the advance guard of a division of cruisers commanded by Admiral Uriu, which, without any provocation, fire their torpedoes at her. One of these torpedoes sinks in its course; the other two miss. This very bad shooting at short range, a real firing exercise against a harmless target, for the *Koricits* had her guns secured for sea, does not give a high idea of the training of the Japanese torpedo-boats; it gives still more weight to the importance already pointed out of having as much actual firing as possible in peace time.

I shall not dwell upon the attack of the *Varyag* by the Japanese division in the Chemulpo passage; that attack is but a secondary incident of the first and really important act of the great military drama of the conquest of command of the sea, of which the two capital scenes are the night and day attack at Port Arthur and the simultaneous disembarkation of the first Japanese troops at Chemulpo under the protection of Admiral Uriu's naval forces. Furthermore, this fight, or more exactly this massacre without glory for the Japanese sailors, is as little instructive as possible for us, since so unequal a struggle as five ships against one caught in a trap, and necessarily overcome under the inexorable law of numbers, could not to any extent furnish matter for profound discussions.

The sole detail of this incident of a nature to call for some consideration would have to do with the regrettable hesitation of the commanders of the foreign war ships in the harbor to remonstrate

against so flagrant a violation of the neutral waters of Korea, a violation which constitutes on the part of the Japanese a real act of brigandage; but its examination belongs to international law.

There is one fact of primary importance to note; from the very origin of this war the Japanese fleet had taken upon the coast of Korea a base of naval operations. The real position of this base is not yet very exactly determined; whether it was at first at a point situated near Chemulpo, and then, after the melting of the ice, at Hai-ju bay, is of little consequence to us. It is the principle that we have especially to bear in mind, and it is of interest to emphasize the fact that, despite their proximity to the Japanese shores, despite the exceptional facilities for obtaining supplies and resources of all sorts that this proximity assured to them, the Japanese squadrons adopted an advanced base, at the very center of naval operations, the nearest possible to their point of attack, and suitable for covering the landing operations of the Japanese armies on the Korean coast.

The chosen position would, under all circumstances, afford an excellent anchorage, defended against the possible attacks of torpedo-boats by natural obstacles, reefs, shallows, narrow passages, etc.

It is to this base that the Japanese fleet always went to anchor in the intervals of its operations against Port Arthur.

The first very distinct period of these operations extends from February 9 to May 15; it is characterized by an effective and undisputed control of the sea by the Japanese navy. They go freely to and fro, and their transports, without the least anxiety in the world, land the Japanese armies upon the Korean and Manchurian shores.

Repeated appearances before closely watched Port Arthur and artillery duels with the sea front batteries of that port have for their object the maintenance of the blockade of the Russian naval forces, and the keeping busy of the defence of the place, much more than attempting to reduce it. These successive attacks coincide, indeed, with the disembarkations of the armies of occupation at Chemulpo and at other points of the coast, and they are intended to protect these disembarkations against any possible offensive action of the forces of Port Arthur. In this respect, their success is complete.

SUBMARINE MINES.

The study of this period is interesting not alone from the foregoing points of view; an event occurs, notable from its frequently repeated consequences even in this relatively short space of time, and forces attention to the important part played by the automatic torpedo, or submarine mine, as a powerful means of destruction, in modern wars.

Employed on both sides, its brutal and blind force strikes blows, so much the more terrible that it is still under little control, against both.

First it is the *Yenisei*, a mine-planting ship, which, after having placed nearly four hundred machines of the sort, explodes one and sinks on February 11; it is a serious matter, for this accident deprives the Russian defence of valuable information as to their exact situations. Moreover, on the next day a violent storm displaces these torpedoes, of which several come to the surface and drift away. Three days later, on February 14, the cruiser *Boyarin* runs upon one of these mines and, receiving a mortal blow, sinks.

In the night of April 12, the Japanese, favored by darkness and steady rain, succeed in their turn in mooring submarine mines on the line of the entrance to Port Arthur, without their action being discovered by the Russians.

On the 13th, the Russian squadron, composed of five battleships and three cruisers, gets under way in the morning; but, finding itself in presence of forces too greatly superior, takes a course to return to its anchorage. It is in this manœuver of retreat that the *Petropavlovsk* encounters one of the Japanese mines, and, after a tremendous explosion, undoubtedly due to the ship's magazines, following that of the mine, sinks in two minutes, carrying down in a glorious death the valliant Admiral Makaroff, a moral loss for the Russian sailors more harmful even than the material losses.

The battleship *Pobieda* also is reached by the explosion by shock of another Japanese mine, which opens in her side a rent ten meters long, extending over four compartments. Till then only the Russians had been tried by mines; the turn of the Japanese was to come.

On May 12 and the following days Admiral Kataoka, with three cruisers and four flotillas of torpedo-boats was supporting off Kerr bay the operations of the army, holding the Russian troops in check by his fire. His torpedo-boats were engaged in clearing the

bay of mines planted by the Russians when, on the 13th, one of these mines exploded and cut in two torpedo-boat No. 48, which immediately sank. On May 14, the cruiser *Miyako* in her turn runs upon another mine and in less than half an hour disappears in the abyss.

Finally on May 15, a grievous day for the Japanese, while cruising off Port Arthur, the battleships *Yashima* and *Hatsuse* strike successively, the first a mine and the second two connected mines. The *Yashima* escapes, very seriously damaged but still able to keep afloat, but the *Hatsuse* goes down in a few minutes.

It is impossible not to be struck by the importance of the part which circumstances gave to engines of this character to play in a period of time of quite brief duration. And the use which may be made of them, in future wars, in closely blockading a naval force in port, in barring a passage, etc., is at once apparent. For this reason it was essential to point out the services rendered by them to one side and the other during the war in the Far East. And it is not without interest to note the frequent and systematic use of the torpedo-boats by the Japanese to clear bays or neighborhoods obstructed by mines. Finally, the laying out of these engines was done, on both sides, by special vessels: the *Yenisei* and the *Amur* for the Russians, the *Koryo Maru* for the Japanese. In all of which there are valuable hints for the future.

THE ATTEMPTS TO BLOCK THE ENTRANCE TO PORT ARTHUR.

During this same period the Japanese made three attempts to bottle up the Russian squadron in Port Arthur. These operations were always carried out in the same way; transports laden with hydraulic cement, and with just enough men to handle them, approached the passage at night, supported by flotillas of torpedo-boats whose function it was to make a diversion; they endeavored to sink themselves in the middle of the channel so as to obstruct it. Either on account of wrong movements, due to the difficulty of exactly marking the position, or because they were distracted by the efforts of the defence—the gun fire, torpedoes, etc.—none of these attempts was crowned with complete and decisive success. Up to May 2 the Japanese had sacrificed in these enterprises not less than seventeen steamships, of displacement ranging from one to three thousand tons, without having succeeded in preventing the Russian squadron from going out.

We may draw various lessons from this practical example; in the first place, the advantage of establishing principal or secondary bases of operations as far as practicable in ports having more than one entrance; then the urgent need of as complete as possible an outer defence, assuring the discovery and destruction, at points far removed from the entrances, of structures sent to close them with their wrecks. Whatever may be the difficulties of such an undertaking to the assailants, this vigilance and these ways of acting are indispensable to exclude any possibility of a success of which the consequences would be irreparable.

THE VLADIVOSTOK CRUISERS.

I have taken the date of May 15 as ending one period of the war, because it corresponds to an apparent cessation, or I may better say a momentary hesitation, in the offensive ardor of the Japanese. Thus they give up a fully prepared combined operation against Nieu-Chwang, from which they withdraw their forces; and thenceforth they adopt Taku-Shan as their point of disembarkation. This modification of the original plan is solely due to the very appreciable naval loss which the Japanese have just experienced, and which, by notably diminishing their strength upon the sea, makes them fear that their superiority thenceforth will be too slight to justify the risk of operations of very great boldness.

This loss of strength has another after effect upon the general plan of naval operations. Till then Admiral Kamimura had had more particularly as mission the establishment, in the Sea of Japan, of a guard intended to keep watch upon and hold in check the Russian division of three armored cruisers.

After May 15, Togo, considering that his superiority upon the principal scene of action is not sufficient, retains part of Kamimura's ships. The repair by the Russians of the battleships *Retvizan, Pobieda* and *Cesarevitch* made this a measure of imperious necessity to him. It is true that he weakened a secondary strategic point, but it was to maintain an effective force at the principal point. This incident emphasizes once again the very great importance of the navy's work.

It is this relaxation of the guard which permits Admiral Bezobrazoff to go out from Vladivostok and to execute a raid which takes him to the neighborhood of Yokohama.

From the beginning of the war, the rôle of this Russian division had been a very insignificant one. After a first sortie, effected two

days after the opening of hostilities, in very bad weather, and in the course of which its action was limited to the capture of a Japanese steamer, it had returned to port.

Closely watched by Kamimura's squadron, which appeared several times before the Siberian port, and the numbers and composition of which, five armored cruisers and two protected cruisers at least, established too great a disproportion of forces to permit fighting successfully, the Russian division only risked itself at sea once, on April 25, when it went as far as Gensan. During this cruise of forty-eight hours in the Sea of Japan, they stopped a fine Japanese transport of six thousand tons, the *Kinshu-Maru*, loaded with troops, and sunk her by means of a torpedo.

Favored by a thick fog, they passed undetected within a few miles of Kamimura both going out and returning. This momentary good fortune was but the passing luck of the gambler, which lures him on to the final and irremediable fall.

The relaxation in the Japanese guard about Vladivostok, after their losses before Port Arthur in the month of May, though it gave the Russian naval division relative freedom of movement, did not give to it what it really needed, that is to say a force sufficient to change the course of events.

It is very true that the Russian cruisers profited by this liberty to explore the Korean strait, as well as that of Tsugaru, during the month of June; that they repeated this expedition at the beginning and at the end of the following month, this time giving it a wider range, since they went within sight of Tokio. It is equally true that in the course of this cruise they seized a number of merchant steamships of various displacements, some with and some without troops and war material. I hasten to acknowledge also that the moral effect of this raid upon the Japanese sea coast population was considerable; that the Japanese commerce was for that very reason interfered with to an appreciable extent; that the cost of maritime insurance was raised sensibly; and finally that the money losses which were the natural consequence of these various disturbances were far from being negligible, since they were estimated at fifteen million yen for a period of a few days.

I am the more ready to establish these facts because they give greater force to the conclusion which we are bound to come to that all these captures of ships, non-belligerents or carriers of contraband of war, all these raids seemingly so bold but really in-

offensive, had, in the final analysis, absolutely no influence upon the course of events and the military solution of the problem. It is the more interesting to note this because as a matter of fact the Russians did nothing else than apply the method of war known by the entirely inappropriate term *guerre de course,* and which in our days is merely the use of war ships in the pursuit and capture of merchant ships.

Upon this point it is needful to be precise; I do not pretend, in my previous remark, to condemn a system of action, but rather the exclusive use of that system. The total strength of a country is made up of the aggregate of all the forces which that country disposes of; military forces first in importance, then industrial, commercial, financial forces, etc. If then, as it is reasonable to believe, the objective of war, its very raison d'être, must be to paralyze the adverse forces, it is logical and legitimate to attack all those forces, without neglecting a single one of them, but only on the express condition of understanding that their totality is the only real power to be destroyed.

Because they were without effect upon the Japanese military forces, the division of Bezobrazoff could have multiplied its raids and have captured still more merchant ships without thereby advancing by a single day the end of the war, without even changing to the very smallest degree its conclusion. Much more, for the same reason, was it marked for certain destruction, after long or short delay, on account of its lack of strength and the obligation which was imposed thereby to shun combat, instead of seeking it as the sole efficient means of destroying the balance to its own advantage.

Although the Russian division on July 1, suddenly finding itself in sight of Kamimura's squadron, in the Korean strait, at nightfall, was able to escape from that superior force by extinguishing its lights and using full speed, the evil day was, could only be, postponed. To retreat, always to retreat, has never been considered an advisable procedure in a duel, for it sooner or later happens that a material obstacle, or some other unforeseen incident, puts the one who retreats at the mercy of the attacking sword of his adversary.

Success in war cannot be, never in any period can have been, obtained by evading battle. History teaches us, on the contrary, that the destiny of fleeing squadrons has always been the same—to be destroyed.

And I do not fear being taxed with tiresome repetition when I recall once again this expression of Tourville: "*From the moment that the two fleets are in sight, so as to be able to make each other out, it is impossible to avoid a fight.*" Certain principles, after the lapse of two centuries, have lost nothing of their truth. And so, on August 14, at daylight, the three Russian cruisers, *Rossia*, *Gromoboi* and *Rurik*, finding themselves thirty miles to the north of the strait of Korea, perceived all at once, about eight miles to the north-northwest, Kamimura's division of four armored cruisers. Without further delay, the Russian ships stood away to the northeast, making every effort to attain their highest speed.

For us, who ought to seek to see beyond mere facts, trying to extract from them their philosophy, it is worth observing, as a new proof of the moral weakness of the Russians, this instinctive feeling which dictates to them flight as the sole means of safety. Doubtless they were under the disadvantage of inferiority of numbers, three ships against four, but a military force is not measured solely by the absolute number of its units; it is further necessary that the unities be of the same kind in order that such a measure may be exact.

And in this case each of the Russian units taken separately was sensibly superior to those of Kamimura. It is true that a little later the protected cruiser *Naniwa* came to reinforce the Japanese; but in spite of everything, under the control of an energetic and resolute chief, the Russian division commanded by Admiral Yessen could have accepted the gage of battle without too great a disadvantage. But it was necessary to fight, and it is truly extraordinary to observe, in the course of history, the surprising number of men, individually brave beyond dispute, who in the practice of the military art have a profound and instinctive dread of *battle*.

	Rossia.	Gromoboi.	Rurik.
Displacement	13,675 tons	13,220 tons	10,933 tons
Maximum speed	21 knots	20 knots	18.8 knots[1]

Anything was better, in any case, than flight, in which the lack of homogeneousness of the Russian division must have evil consequences. By a comparison of the characteristics above set forth of the three cruisers, it is very quickly seen that the actual speed of the *Rurik*, a relatively old ship, being sensibly less than that of

[1] The *Rurik's* trials going back to 1892, we may be sure that her actual maximum speed was much lower than that given.

the other two, became of necessity the real speed of the division if the latter remained intact, in which case it could not escape the pursuit and was forced to the necessity of engaging in battle under conditions more disadvantageous, consequently, than if battle had been energetically sought for.

If, on the contrary, in the excitement of their flight, the elementary principle that in union alone is strength was forgotten, each cruiser would attain her highest speed and the fatal result would be the isolation of the slowest ship.

That is what happened to the *Rurik*, which had to support almost the whole fire of the Japanese concentrated upon her, and this so much the more because an injury to the steering gear, caused by a shell almost at the beginning of the engagement, prevented her manœuvering. At that very moment, the *Rossia* and *Gromoboi* afforded the best of all proofs of what they could have accomplished if their commanders had been imbued with the true conceptions of war. In order to disengage the unfortunate ship, they went to her assistance to enable her to make repairs, and succeeded in holding the Japanese cruisers in check by a steady fire which did serious damage to the *Idzumo*, the flagship. But, as if this fortuitous effort had used up their reserve strength, blind instinct urged the Russians to retake their mad course towards Vladivostok the instant that the *Rurik* signalled that her damage was repaired.

This time, nothing could stop the *Rossia* and *Gromoboi* in their flight, and to use a familiar but imaginative naval expression, the *Rurik* was soon "left."

While the two leaders supported the fire of the four Japanese armored cruisers, the *Rurik*, several miles astern, had to oppose the *Naniwa* and two other protected cruisers which had joined her. The unhappy ship, left to her own resources, much weakened by the fire of her opponents, soon had her guns put out of action one after another and her commander killed, and finally she is sunk by opening the sea valves.

And yet there was a good chance still for the Russian division, since Kamimura, after five hours' fighting at six thousand meters range, abandoning the pursuit of the *Rossia* and *Gromoboi*, suddenly stood away for the Korean coast, doubtless because his armored cruisers were themselves too much distressed and especially because they were out of ammunition. By turning back again to

the aid of the *Rurik*, these two ships would very probably have delivered her from her relatively feeble adversaries and saved her from the final catastrophe.

They limited themselves to stopping to repair their greater damages and then, without disturbing themselves, steered for Vladivostok. The results given by their weak and indifferent behavior justify counting upon the very different one which an energetic and vigorous offensive would have given. So, in analyzing this incident of the war, I do not think that I am deceived in believing that on this occasion the Russians had success within their grasp. A *man* was wanting to them, and the confidence of success that comes from the perception of a wise preparation for war.

This sortie of the Vladivostok division, effected on August 12 and terminated so tragically on the 14th, had had for its special object to facilitate the escape to that Siberian port of the naval forces still stationed at Port Arthur.

THE SORTIE OF AUGUST 10.

The period from May 15 to August 10 is characterized by the slow but continuous investment of the stronghold of Port Arthur by the Japanese armies, the progressive shortening of the iron circle which closes in upon it until the Russian war ships, hidden in the harbor, have left only a choice of two alternatives, either passively to let themselves be destroyed at anchor by the fire of the siege artillery, or to seek to break the blockade and gain Vladivostok.

During these three months what was left of the Russian fleet remained completely inactive or very nearly so. The Japanese fleet could appear frequently on the coast, engage in artillery passages with the batteries of the defence, support from the rear the offensive operations of the troops all along the shore; nothing could succeed in arousing this do-nothing fleet from its torpor. It is almost certain, and this would explain such incredible inactivity, that several improvised batteries on the sea front were armed with guns taken from the ships. If this be true, it is one of many proofs of the persistence of the strategical error committed by the Russians; if anything had to be sacrificed, it surely was not the naval force, the most valuable of all, but much rather the purely nominal base which had no raison d'être except for the existence of the fleet.

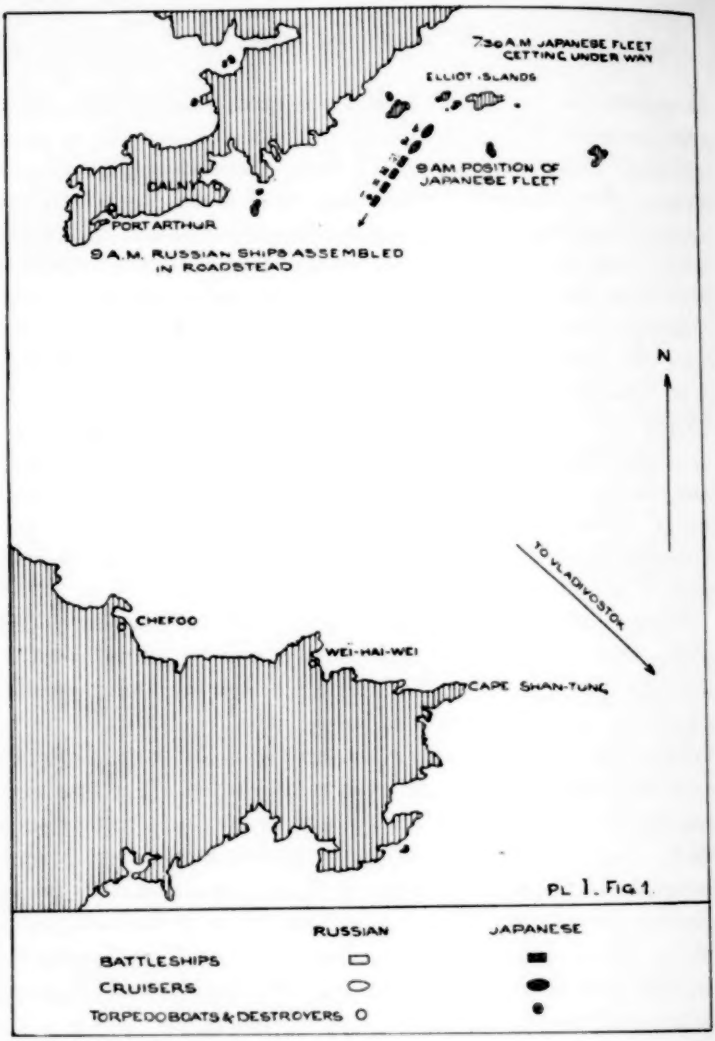
Once only, on June 23, this squadron gives a sign of life: it gets under way with Admiral Vithoft in command; it is made up of six battleships, *Cesarevitch, Peresviet, Pobieda, Poltava, Retvizan, Sevastopol,* of the armored cruiser *Bayan,* of the protected cruisers *Askold, Diana, Pallada, Novik,* and of ten torpedo-boat destroyers. At three o'clock in the afternoon, it stands out to seaward; towards five o'clock the Japanese squadron is in sight, formed of four battleships, seven armored cruisers, ten protected cruisers and thirty torpedo-boats. The Russian admiral changes course, then turns completely round and heads for Port Arthur, pursued by Admiral Togo's forces, which, however, do not get near enough to open fire; towards nine o'clock in the evening he anchors in the outer roadstead and on the following morning takes his ships back into the harbor. All the narratives, in relating this incident, agree in making clear the disastrous effect of this futile sortie upon the morale of the Russians.

We may well ask what Vithoft could really have hoped to gain by this sortie. He evidently had no intention of fighting, since the mere sight of the Japanese fleet dictated to him the fatal resolution to return to anchor; neither is it any more credible that he intended to try to reach Vladivostok, for the hour of the departure would have been, in that case, very badly chosen. The first principles of the profession of seaman and of blockade runner show that the most favorable conditions for success in that sort of enterprise are to be found all together at night. It was only by taking advantage of the night, directing the bulk of his forces, which were very far from being negligible, against one wing of the blockading line, while the torpedo boats made a diversion at another point, that he could have any chance of getting through.

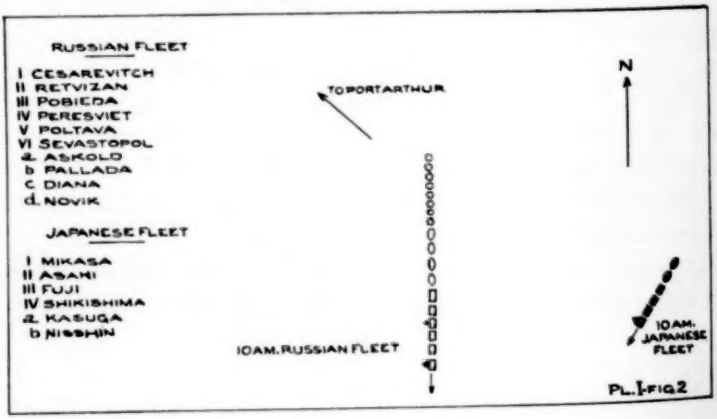
It is quite likely that the Russian admiral really did not have any very clear objective. Of all the conditions of war this is surely the most fatal, for better even a poor plan than no plan at all. Another bad feature, and not a small one, of this unfortunate sortie was that it convinced the Japanese sailors that, with adversaries as timid as the Russian sailors, anything could be dared.

This conviction was already half of success, as it had been for Nelson before Villeneuve's sortie from Cadiz.

On August 10, the Russian squadron was finally obliged to leave its resting place, under penalty of being destroyed by the Japanese



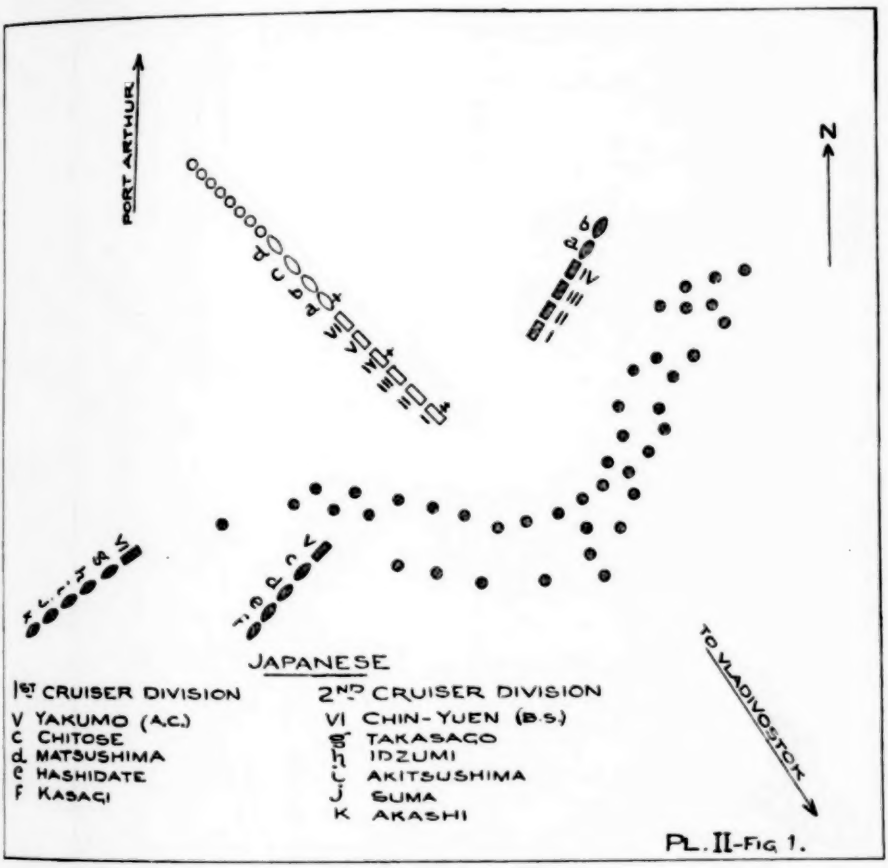
PL. 1. FIG. 1.



PL. I. FIG. 2

fire opened from Wolf hill, to which they could not effectively reply.

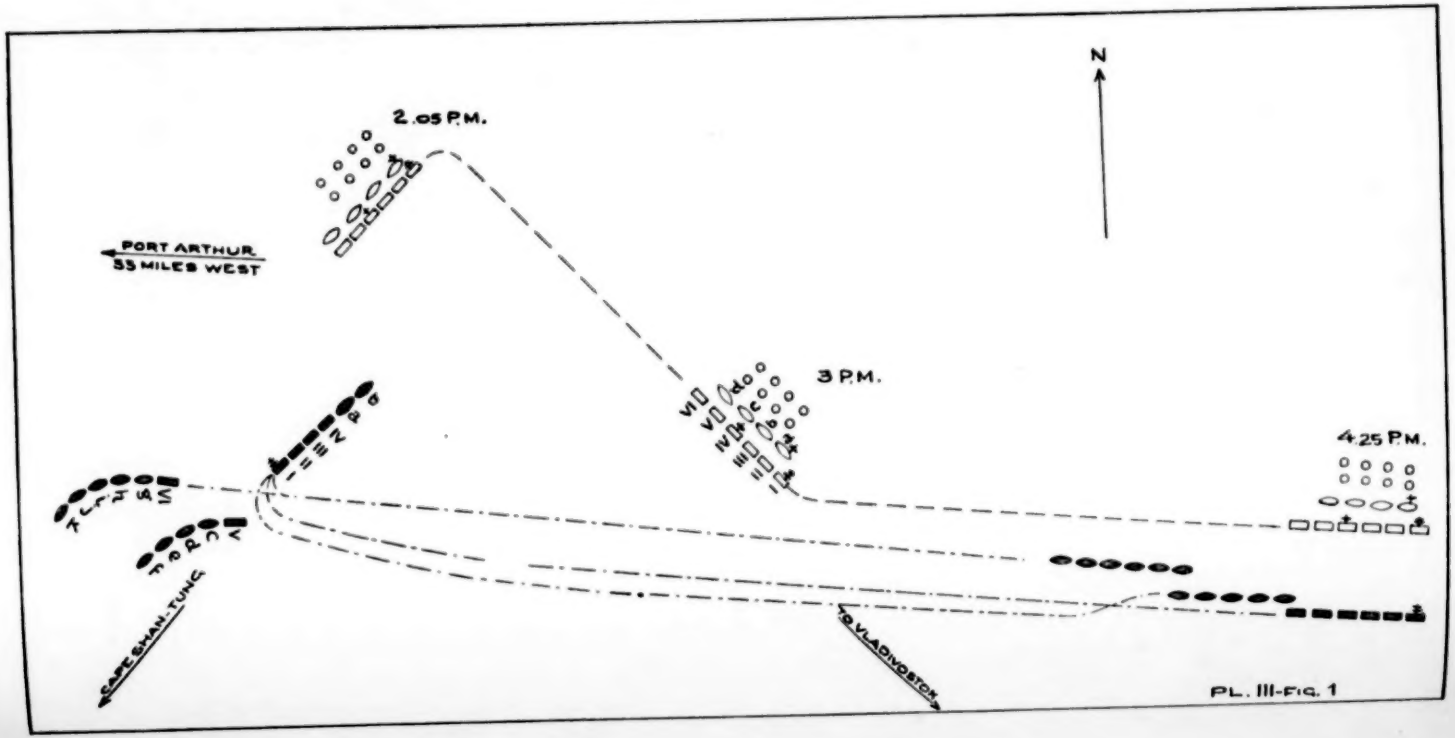
The six battleships got under way at eight in the morning, followed by the three cruisers *Askold*, *Pallada* and *Diana*, preceded by the *Novik* convoying seven[1] destroyers. At nine o'clock they



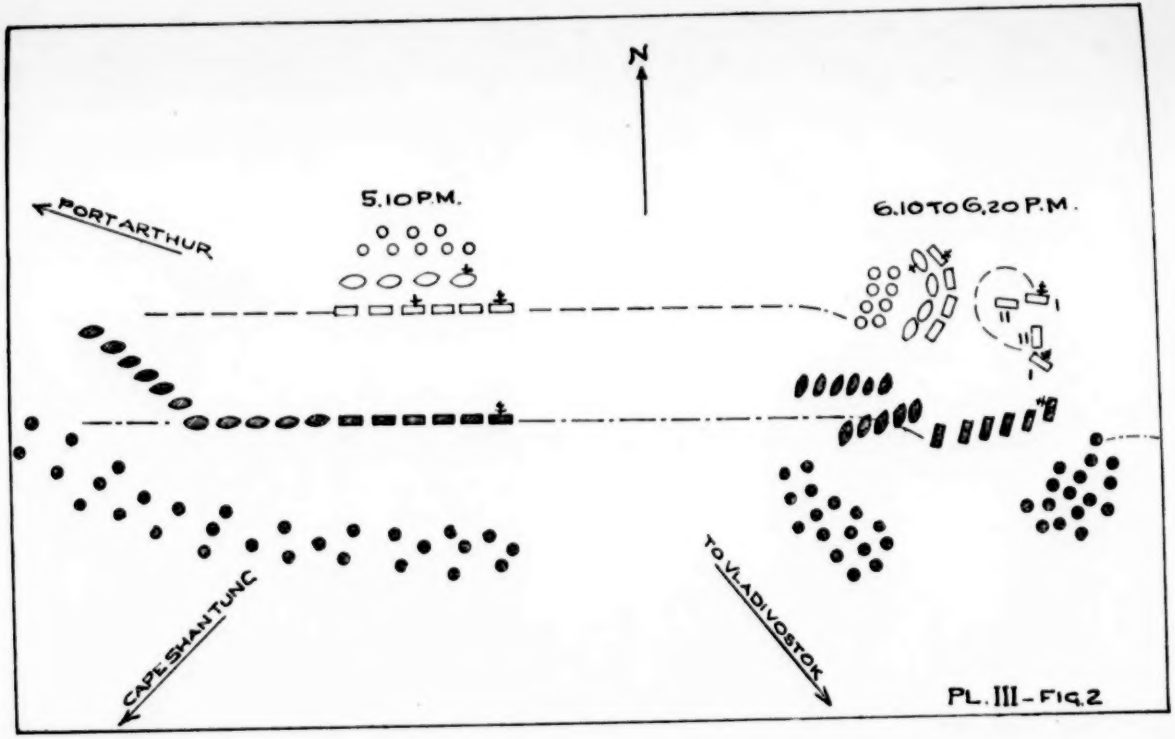
POSITION AT 11.30 A. M.

headed for Shantung Promontory at a speed of thirteen knots (Plate I). Almost immediately the first Japanese squadron is made out to port; it consists of the *Mikasa*, *Shikishima*, *Asahi* and *Fuji*, battleships, and the *Kasuga* and *Nisshin*, armored cruis-

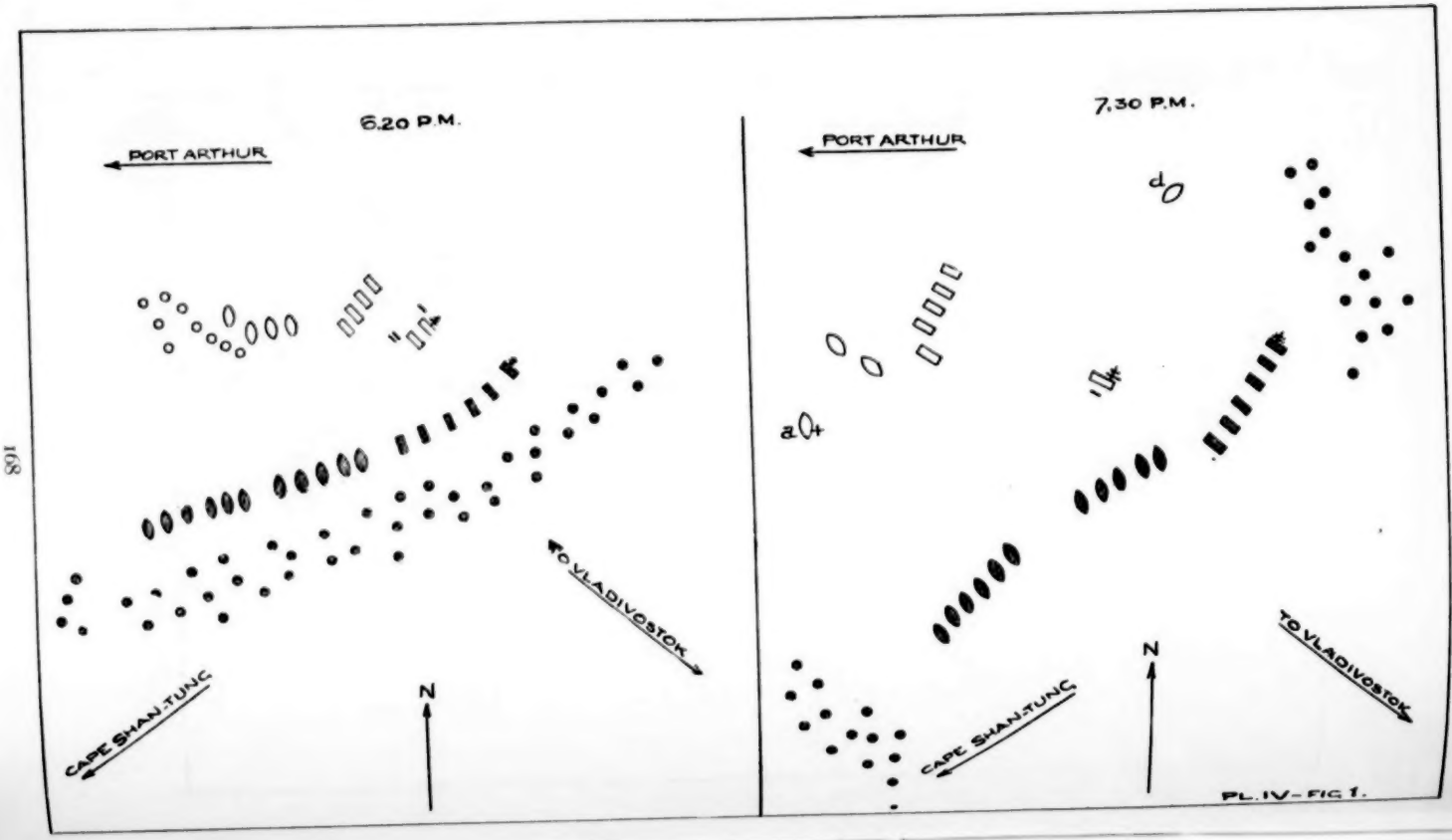
[1] The illustrations show eight.


N
2.05 P.M.
PORT ARTHUR
33 MILES WEST
3 P.M.
4.25 P.M.
ALPHA
BRAVO
CAPE SHAN-TUNG
TO VLADIVOSTOK

PL. III-FIG. 1


N
5.10 P.M.
6.10 TO 6.20 P.M.
PORT ARTHUR
CAPE SHANTUNG
TO VLADIVOSTOK

PL. III - FIG. 2



PL. IV-FIG 1.

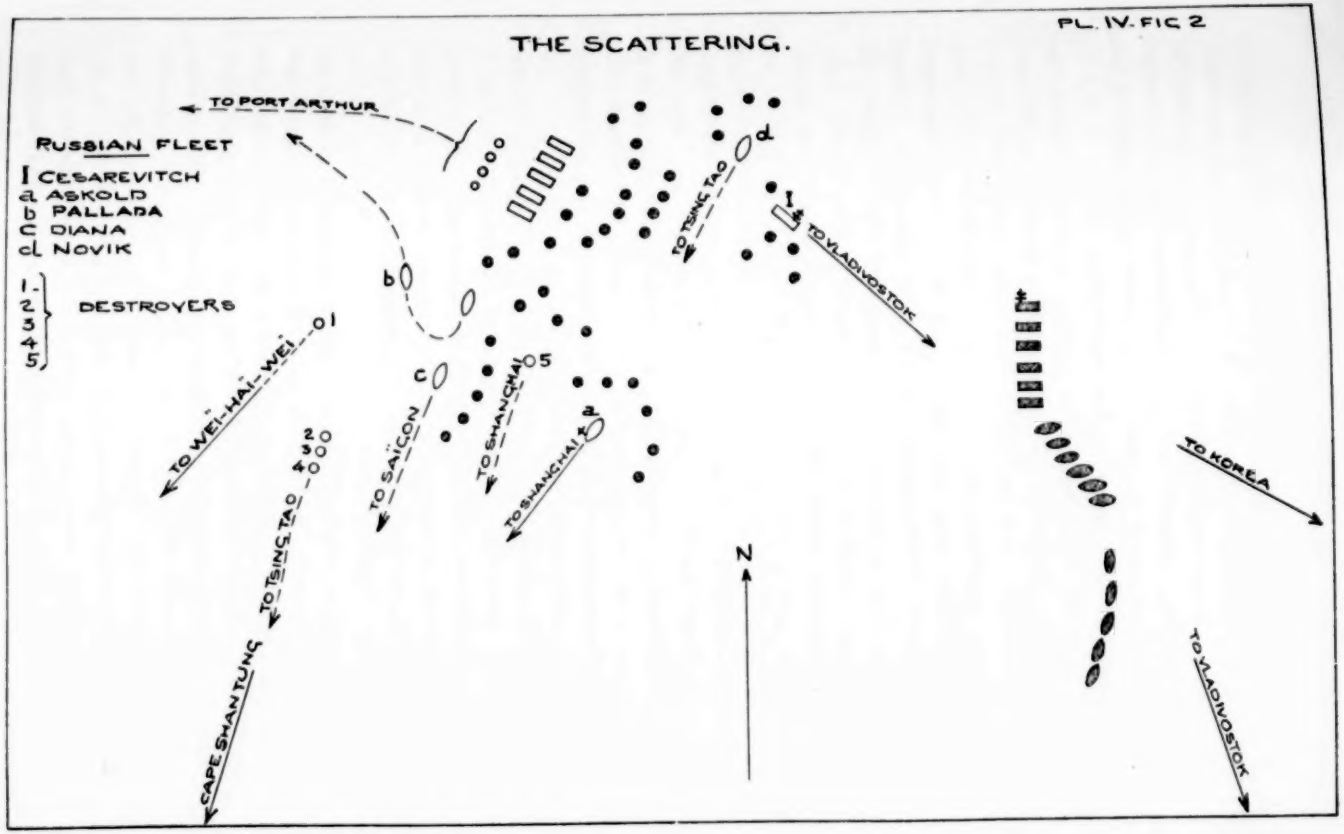
PL. IV-FIG 2

THE SCATTERING.

PL. IV - FIG 1.

PL. IV. FIG 2

THE SCATTERING.



ers, together with a considerable number of destroyers or torpedo-boats, about forty altogether; then a little later the second squadron is seen on the starboard quarter. These forces are very far apart; the first, composed of four battleships and two armored cruisers, to the east; the second, composed of the *Yakumo* and three protected cruisers to the west-southwest.

The Japanese fleet steers on a slightly converging course and gains in the chase. The Russian squadron continues in the same direction, which is that leading to Vladivostok, until noon; then it turns to the northeast, very probably intimidated by the thick screen of hostile torpedo-boats which have placed themselves across its path. These torpedo-boats, it is said, visibly scattered over the surface of the sea buoys, kegs and other things which could from a distance be taken for mines. The morale of the Russians evidently could not stand against this terrifying appearance (Plate II, Fig. 1).

At one o'clock an artillery contest, *at extreme range*, is begun with Togo's squadron on the starboard hand, but there is no great damage done. At five in the evening, the two lines were still seventy-five hundred meters apart, and were exchanging shots; at half past six a shell struck the *Cesarevitch* and killed Admiral Vithoft, while at the same instant control of the ship was lost through an injury done to her helm (Plate III).

This serious damage, attributed somewhat too hastily in the first advices to a projectile having struck the rudder *below the water line*, was the result of a 12-inch shell exploding in the sighting holes of the conning tower and destroying the steering apparatus as well as all the means of communicating orders (Plate IV, Fig. 1).

A first version attributed to the other battleships a vigorous attack upon the enemy with a view to getting about the *Cesarevitch* and protecting her while she repaired her damages; but the night was coming on, and Admiral Ukhtomsky, who had assumed command, judging his ships too weakened to be able to hope to force their way through and reach Vladivostok, resolved to return to Port Arthur and made signal to follow his movements. He thus rallied five battleships that he was able to lead back and, on the following morning, take into the port which he had just left; but he did not take back there his honor as a leader; that was lost forever in this affair (Plate IV, Fig. 2).

The analysis of this sortie of August 10 is suggestive in more than one respect. In the first place it illustrates that instinctive repugnance to fighting which throughout the past has always characterized timid nations and which is to-day the undeniable trait of the Russian navy. That Russian squadron of six battleships was a force of considerable strength, sufficiently homogeneous and powerful to compensate by these qualities for its numerical inferiority relative to a fleet which, excepting the *Mikasa*, *Shikishima*, *Asahi* and *Fuji*, comprised only ships of incomparably less military value. This composition, for the first time very much mixed, of the Japanese fleet, can only be explained by their considerable losses in the operations off the Liau-Tung peninsular.

Yet not for a single instant in the course of that interminable artillery duel in cruising order, which lasted hardly less than eight hours, did the Russian commander-in-chief have the appreciation of his real strength. It never even occurred to him that perhaps there was something better to do than run away, that by falling resolutely with his main body upon one of the Japanese squadrons, he would have a chance of annihilating it and of opening for himself a passage.

When they went out from Port Arthur, the Russian naval forces had the rare good luck to find the two Japanese squadrons separated by a distance great enough to offer a fine opportunity. If, instead of changing course to the northeast at noon, the Russian commander-in-chief had boldly assumed the offensive by bearing down upon Togo's squadron to the eastward, there is no doubt that he could have offered fight under conditions of equality of forces sufficiently satisfactory to give him hopes of success. If the Japanese admiral had accepted the challenge, and everything indicates that on that day he would have submitted to rather than sought close action, the losses experienced by his ships would have had a decisive influence upon the remainder of the campaign. If, on the contrary, the Japanese admiral had refused the fight by standing away, this manœuver would have favored the Russians' object.

Therefore such an energetic attitude could not have failed to be of profit to them in all ways. But it would have required the will to fight and take risks, and they never even suspected that that could be of any use; even more, far from seizing the opportunity offered by the separation of the Japanese forces, they did every-

thing to facilitate the latter's concentration and thus to give to them the superiority of forces which they lacked.

How many truly disconcerting events in war prove the imperious necessity of a doctrine!

In speaking of the commander-in-chief, I refer to Vithoft in particular no more than to Ukhtomsky; the personality is of no importance, it is the system which it represents and which is named indecision or want of will.

And this time again it may be asked: *Why, if the Russian squadron wished to evade battle and merely to break through the blockade, why, in that case, did it go out in the daytime?*

From the result obtained while the *Cesarevitch*, stopped, repaired her damages, we can judge what an energetic and bold chief with his five other battleships would have secured. This is not an unwarranted hypothesis, for it is impossible not to characterize Togo's action as also very weak. Numerous incidents of the affair prove it. Not only did he fail, during an entire day, to secure a decisive result against a manifestly demoralized enemy, but when the latter was beaten and his forces dispersed, he did not succeed in barring a passage to them.

While the five battleships are going to Port Arthur, the *Cesarevitch*, almost wrecked and only able to make four knots speed, proceeds at that tortoise gait to Kiao-Tcheou, and arrives there on the following evening without having been troubled otherwise than by a torpedo-boat attack just as she left the field of battle.

According to a more recent version, the Russian battleships did not turn back at all to help the *Cesarevitch*, but the latter, taking a great sheer on account of her helm damage, ran into the midst of the enemy's line, throwing them into disorder. This account, much more in accord with the Russian demoralization, and which I regard as probable until time permits the truth to be known, does not invalidate the preceding argument; far otherwise, indeed.

The light division, commanded by Admiral Reitzenstein, had energetically forced a passage through the Japanese squadron, and that, characteristically, not in an endeavor to preserve its forces for their country but to flee, always to flee. The *Askold* succeeded in reaching Wusung, the *Diana* got as far as Saigon, and finally the *Novik*, excepting the *Retvizan* the only example of valor in the whole affair, after having stopped less than twenty-four hours

at Kiao-Tcheou, proceeded to Saghalien where, after a combat with a Japanese cruiser, her commander sunk her.

More proof than is necessary may be found there to show how indecisive and vacillating the Japanese pursuit itself was. With a Suffren at its head the Russian squadron might have hoped everything, and I make this remark to note in passing how great the importance of moral worth is among all the various forces whose close union constitutes the military strength of a nation.

It is not to be doubted that the feebleness of Togo's pursuit was an error of doctrine. It has been claimed as his excuse that the Japanese admiral, on his own initiative or under orders from his government, wished to be sparing of his ships in prevision of the arrival of the Second Pacific Squadron. The error would be a great one, for the opportunity of destroying the forces, even partial, of the enemy, is always too valuable to be allowed to escape. He would much more surely have secured the final preponderance of force by the destruction of the Port Arthur squadron, even at the cost of damages to his own ships, than by letting it escape almost intact.

Though this error of principle did not have great consequences, not the less it was committed; none can foresee the future, and Togo forgot, on August 10, that Suffren and Nelson never postponed to a later day what they could do then and there.

Just as in the case of June 23, the causes of this inconceivable cowardice on the part of the Russians must be sought in a foolish, unreflecting fear of the attacks of torpedo-boats which, as night came on, spread through all their ships illusion and fright, hypnotizing all their faculties upon a single object, flight. That alone can explain why both the attempts to break through the blockade were made in full day.

And yet there was no occasion to dread so much the attacks of those little vessels. I do not say this, you may be sure, on the mere ground of personal opinion. I should have no right to do so here, where I am under strict obligation not to advance any proposition which is not supported by practical examples readily to be found.

At the moment of the breaking up of the Russian squadron the light division had been attacked by the Japanese torpedo-boats; four of them fired, each a single torpedo, at the *Askold* unsuccess-

fully, and one of the four was sunk by the *Askold's* gunfire. This attack was not renewed, and the torpedo-boats disappeared.

The greater part of the flotilla had joined in the pursuit of the five Russian battleships fleeing to Port Arthur. During the night these ships were the object of repeated attacks in which the Japanese torpedo-boats fired not less than sixty torpedoes *without any result.*

Finally, in spite of the reduced speed which made her a very easy prey for her adversaries, the *Cesarevitch,* in leaving the field of battle, withdrew unharmed from an attack by another group of torpedo-boats which fired ineffectively a dozen torpedoes.

These far from brilliant results justify, I believe, what I have already said in regard to the insignificant part played by torpedo-boats in the Russo-Japanese war. If it were not for certain more encouraging facts of previous wars, and particularly if one did not know to what a degree, in this special branch of the naval personnel even more than any other, patient preparation and training in time of peace influence results in time of war, it would be legitimate to doubt the value of the instrument. Here again the conditions were such that none better could be desired.

In regard to the principle itself of the sortie of August 10, it can be said that it was perfectly legitimate, on condition that its object was battle and not flight. By so acting, and we have seen that the conditions were favorable, the Russian squadron of Port Arthur would have prepared the way for the Second Pacific Squadron much better than by gaining Vladivostok without fighting. The ends of war are met by seeking the enemy and not by running away from him. The formal orders of the Emperor, if it be true that such had been given, would not have sufficed to fetter the initiative of a true military leader conscious of his responsibilities.

However that may be, the return of the Russian battle fleet to Port Arthur consummated definitely the ruin of the last hope of saving that fleet; it buried itself living in its tomb, for some months later the voluntary destruction of its units, before the surrender of the place, was but a mere formality. It really died, as a moral force even more than as a material force, the day of its return to port. We shall speak of it no more.

THE SECOND PACIFIC SQUADRON.

While these events were happening in the Far East, Russia was preparing in her European arsenals a new naval effort to regain naval supremacy. A naval force, which later was called the Second Pacific Squadron, armed in the Baltic ports with the Far East as its destination.

Further on we shall have to study in detail the operations of this fleet, but it seems to me useful, in conformity with the method of analysis thus far employed, to make a preliminary examination of the motives which dictated sending it and above all the directing ideas and intentions.

To tell the truth, I am very sure that these motives were purely sentimental, and that at the origin of this measure, so important in its consequences, there was not any seriously developed strategic plan. The long delays in the preparation of this naval force, the indolence in the labors of arming its ships, the indecision betrayed by the announcements, as numerous as false, of its constantly postponed departure, all, even to accidents caused by ignorance or by malice, denotes a situation from which every military conception is absent.

These half-hearted preparations give the impression of a decision taken much rather to afford a sham moral satisfaction to the national self-esteem than to carry out a logical and deliberate plan of war.

And surely there was opportunity, even at that moment, for a strategic combination of large scope, capable of restoring victory to the Russian banners. But for that it would have been necessary to renounce the delusion of that long ribbon of steel, the Manchurian railroad, and to shake off the dream of a constant communication, more theoretical than practical, afforded by that iron way with the immense, inexhaustible resources of the Empire.

By the middle of May, this railroad could still only carry eight hundred men a day. This figure reached about fifteen hundred at the beginning of June and two thousand at the end of that month, but it fell back to eighteen hundred at the beginning of November.

At the end of January, 1905, the Russian army still comprised only three hundred thousand men *at the most*. The battle of Mukden was fought with this force, about two-thirds that of the Japanese.

Above all it would have been necessary to understand how much

the celebrated expression of the "Kaiser," "*The future is upon the sea*" was applicable to the situation.

Let a Russian fleet, even after the unfortunate sortie of August 10, make its appearance in the Far Eastern waters, in sufficient force to take away naval supremacy from the Japanese, and the whole course of events would be reversed. The mere evocation of this possibility immediately makes all its consequences appear. They were first the immediate rupture of the communications of the Japanese forces of invasion with their home base, the impossibility of their receiving new re-enforcements or fresh troops, the suppression of regular arrivals of supplies, food as well as munitions. To sum it all up, loss of command of the sea must be, for the Japanese, the sudden shutting off of the reservoir which generously fed the Japanese military effort by supplying it with life and energy.

The certain result would have been to force the Japanese armies of occupation to a precipitate retreat, a worse one than that of 1812, for Napoleon and the Grand Army at least were not cut off from their base of operations.

The prospect was good enough to justify the necessary effort on Russia's part; there only was safety for her. This effort was quite possible, moreover, at least so far as material was concerned, for by calling upon all the naval resources still available in her home ports there were enough elements to make up a very strong fleet, notably superior, at any rate, to that which the Japanese could still put in line.

It would be easy to draw up a comparative table in which the units, distributed in as homogeneous squadrons as possible, would give an idea of the greatness of the effort permitted by Russia's still remaining resources, and of the probable power of resistance of their adversaries. But this is not necessary; a glance over the lists of the two fleets is enough. Under the leadership of a great chief the game would still have been a good one; and here I am almost compelled to stop short; in my desire to present, in the very spirit of the principles of naval strategy, an example which was a true practical lesson, I was about to lose sight of the fact that all this available material was good for nothing without a personnel capable of bringing out its value, that these ships represented only a virtual energy, if they lacked men able to put life into them, that finally, had they been ten times as numerous, the Russians would

still have been beaten because they did not have to any extent the most essential of all the elements that make up military strength—moral force.

These just reflections nevertheless take nothing away from the preceding argument. It is not permitted to make war lightly, and in the case which we are considering either it was necessary to send to the Far East a naval force capable *beyond any doubt* of gaining command of the sea, or not to do anything at all. All war plans can be defended excepting half measures. The Rozhestvensky expedition was only a half measure; it was for that very reason impotent even before it set out.

It will be noted that in the preceding reference to the available Russian forces I have taken account of the ships stationed in the Black Sea, while the Second Pacific Squadron did not include any of them. It would seem, therefore, at first sight that my argument, resting upon a feeble support, since the Russian Government did not believe it possible to utilize these resources, would have at most the value of a theoretical criticism. Such is not the case, and although the subject is apparently one outside our field of investigation, I shall discuss this objection because it raises an interesting question of political strategy.

Forgetting this maxim of Napoleon: "*When you wish to fight a battle, assemble* ALL YOUR FORCES, *do not neglect any, one battalion sometimes decides the fate of a day,*" a doctrine wonderfully applicable to naval war, the government of the Russian Empire did not dare to utilize its important forces of the Black Sea, and, acting thus, it allowed itself to be intimidated by a simple written document, thus giving to the world another example of its hopeless feebleness.

My reference is to the treaty of Paris, and at once there is felt such a disproportion of cause and effect, between the restrictions put down on a piece of paper by diplomats assembled about a green table and the forced inactivity of an important military force necessary to the safety of a great nation—that simple common sense refuses to accept it.

It would have been difficult, moreover, to make common opinion understand that the clauses agreed to in 1856, at the end of a general European war, could be applicable to war between two belligerent nations one of which had no recognized existence when the treaty was signed.

Furthermore, the preamble of the treaty of Paris reads thus: "*Their Majesties the Emperor of the French, the Queen of the United Kingdom of Great Britain and Ireland, the Emperor of all the Russias, the King of Sardinia and the Emperor of the Turks, animated by the desire to put an end to the calamities of the war, and wishing to provide against the return of the complications which have given rise to it, have resolved to agree with his Majesty the Emperor of Austria, upon conditions for the re-establishment and maintenance of the peace by assuring, through efficacious and reciprocal guarantees,* THE INDEPENDENCE OF THE TURKISH EMPIRE."

The object of the treaty is wholly contained in the last underlined words, and there was no other.

It would be necessary to possess great mental obliquity, or the inexhaustible faculty of discussion of a shrewd diplomat, to see in this agreement anything but the single care to safeguard the integrity of Turkey and thereby to maintain the European balance of power. How then could it have been held that the bonds placed upon Russia by the contracting powers to assure this single object could not be cut in case of conflict with Japan, nonexistent in 1856 and in any case not having, far or near, any interest in the Oriental question!

Article 7 of the treaty further states: "*Their Majesties* (the contracting powers) *agree, each on his own part, to respect the independence and territorial integrity of the Turkish Empire, guaranteeing in common the strict observance of this agreement, and they will regard, in consequence, any act of a nature to violate it as a question of general interest.*"

Any other intention than respect for the integrity of the Turkish Empire being evidently omitted from these written instruments, it would have been necessary to demonstrate that the departure of the Russian naval forces from the Black Sea threatened the security of the Sultan in order to make them applicable to the Russo-Japanese war, the mere supposition of which would have seemed to the plenipotentiaries of 1856 the wildest of dreams.

Such a demonstration would have been the more difficult, because the notable weakening of the Russian navy in the waters of the Black Sea would, on the contrary, admirably satisfy the spirit of the treaty.

The fundamental principle of the treaty failing, an argument

has frequently been based upon its article 11, relative to the neutrality of the Black Sea. "*The Black Sea is made neutral: open to the merchant marine of all nations, its waters and its ports are, formally and forever, interdicted to war ships either of the adjoining powers or of any other power.*"

But the stipulations of this part of the protocol of 1856 remain inoperative to-day from the single fact that there is a Russian squadron of the Black Sea.

There is the less room for doubt in regard to this particular question because, by a special agreement signed after the treaty, Russia and Turkey made a mutual solemn engagement to each maintain in the Black Sea only "*six steam vessels of fifty meters waterline length, of a displacement of eight hundred tons at the most, and four light vessels, steam or sail, of a displacement not to exceed two hundred tons each.*"

It is quite curious to note that these little vessels would be represented to-day by torpedo-boat destroyers; this remark emphasizes the strained construction of the treaty, and the bitter irony of the *eternal* (!!) engagements entered into by diplomats.

A last argument remained to those who, under an affirmation of respect for treaties, really mask their incurable fear of action; it relates to the act annexed to the treaty of Paris, by which the signatory powers of the London Convention of 1841 reciprocally agreed to respect the ancient rule of the closure of straits to foreign warships.

But the text of this act contains only a single declaration of principle on the Sultan's part, which the other powers agree to respect, but the observance of which belongs to him alone to enforce. We may well believe in this matter that the Porte would have viewed with pleasure a squadron's definite departure which would have freed it from a permanent threat in its immediate neighborhood and would have put everything in conformity with the spirit as well as the letter of the treaty of Paris.

All the reasons called upon to justify the inaction of the Black Sea Squadron are therefore bad. There is much more to be said on this subject, but it would exceed the limit I have set for myself. It is sufficient to have made it clear that once more the new plan, upon which depended the whole effort to win the victory, was not inspired by any strategic idea. To conclude, there is one single and only cause why unhappy Russia must inevitably have been

beaten; neither before nor during this disastrous war has she ever known what it was to *prepare* her operations. Finally and above all, neither her diplomacy, nor her strategy, governmental, military and naval, nor her tactics in the theater of war, have known how, or wished, to dare.

This long digression will not seem useless, for it will tend to a better understanding of the reason for the complete failure of the Second Pacific Squadron.

The study of this squadron's operations comprises two absolutely distinct phases: a purely maritime expedition and an act of war. The first, certainly interesting, gave better promise for the second than was borne out.

The task imposed upon Admiral Rozhestvensky was really a hard one. To lead an imposing fleet from the Baltic Sea to the Far East, without other resources than those obtained wholly by way of the sea, in the absence of advanced bases, of well provisioned stopping places on the route, appeared to the sailors of all countries a more than difficult, almost impossible, enterprise, and many were convinced that he would fail completely.

The success is entirely due to the indomitable energy of the leader of the Russian fleet, for all the information gathered relating to this voyage agrees in attributing the fortunate completion of so long a cruise, with completely demoralized crews, solely to his tenacity of purpose and iron will. It is regrettable that this man did not have the military sense as well developed as the seaman's sense.

The study of the arrangements to be made, with a view to overcoming the considerable difficulties of all sorts to be met with in the course of so extraordinary a journey as this one, is too far removed from my chosen subject. I shall be satisfied here, after the foregoing statement of the results obtained by a leader's moral force, even under quite unfavorable circumstances, with formulating some reflections on the subject of the Hull incident.

All of its details are known, and, to perceive the exceptional qualities of coolness and judgment necessary to the making of a great naval chief, the entire report of the international commission must be read.

For ourselves, who are not bound to the same reservations of indulgence and of diplomacy as the members of that commission, we can very well say that the presence of Japanese vessels on the

Dogger Bank, during the night of the Russian squadron's passage, was more than doubtful. The single cause which provoked the Russians' fire against the inoffensive and peaceable trawlers is the same as that which made the sortie of August 10 abortive; it is a measureless fear, akin to madness, of the torpedo-boat, of the *phantom torpedo-boat*, which assumes, to the anxious eyes of the Russian sailors, the most extraordinary shapes. The special details in the case of the *Kamtchatka*, which exhibit this vessel delayed in rear of the squadron, seeing torpedo-boats everywhere, to the extent of opening fire upon every vessel she met, are a particularly good proof.

Thus, as soon as this affair, unique of its kind, became known, the value of the military force of a squadron in which indications of such a moral depression were shown could already be doubted.

THE BATTLE OF TSUSHIMA.

On May 27, at five o'clock in the morning, the Second Pacific Squadron was sighted by the Japanese scouts off the Eastern passage of the Korean Strait, towards which it was directing its course.

Admiral Togo, informed by wireless, immediately got under way from his base and steered for the same point with all his forces. Thenceforth the encounter was inevitable.

But the inclinations were far from the same on both sides. In the Japanese fleet they went eagerly to the battle, on the Russian side they submitted to it. Rozhestvensky's objective was so evidently and so exclusively *to get to Vladivostok at any cost*, that he had not arranged for any battle formation even then when contact with the Japanese scouts should have convinced him of the certainty of an approaching attack. He advanced towards the enemy in the same order, in columns, which he had prescribed for cruising, the right column made up of the *Rozhestvensky* and *Folkersham* divisions, the left column of Nebogatoff's coast defence ships and Enquist's cruisers, and the convoy protected by these cruisers following behind the squadron (Fig. 1).

Before entering the strait, the commander-in-chief seemed to have become aware of the disadvantage of his formation in the event of an attack, for he formed single column by placing his own ahead of the left column (Fig. 2). But almost immediately afterwards he displayed to all an irresolution which augured ill by

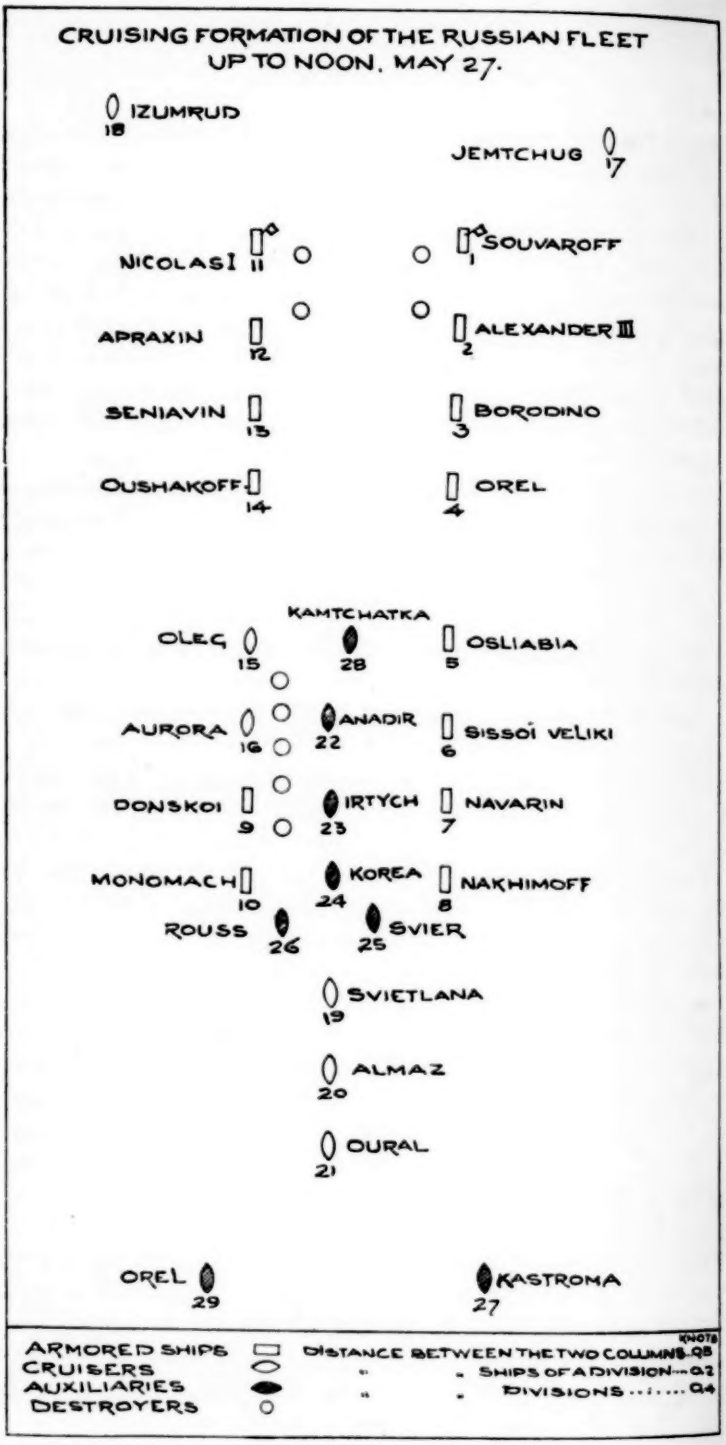

CRUISING FORMATION OF THE RUSSIAN FLEET
UP TO NOON, MAY 27.
IZUMRUD
18
JEMTCHUG
17
NICOLAS I
11
SOUVAROFF
1
APRAXIN
12
ALEXANDER III
2
SENIAVIN
13
BORODINO
3
OUSHAKOFF
14
OREL
4
KAMTCHATKA
OLEG
15
28
OSLIABIA
5
AURORA
16
ANADIR
22
SISSOI VELIKI
6
DONSKOI
9
IRTYCH
23
NAVARIN
7
MONOMACH
10
KOREA
24
NAKHIMOFF
8
ROUSS
26
SVIER
25
SVIETLANA
19
ALMAZ
20
OURAL
21
OREL
29
KASTROMA
27
ARMORED SHIPS
CRUISERS
AUXILIARIES
DESTROYERS
DISTANCE BETWEEN THE TWO COLUMNS
" " SHIPS OF A DIVISION
" " DIVISIONS
KNOTS
0.5
0.2
0.4

FIG. 1.

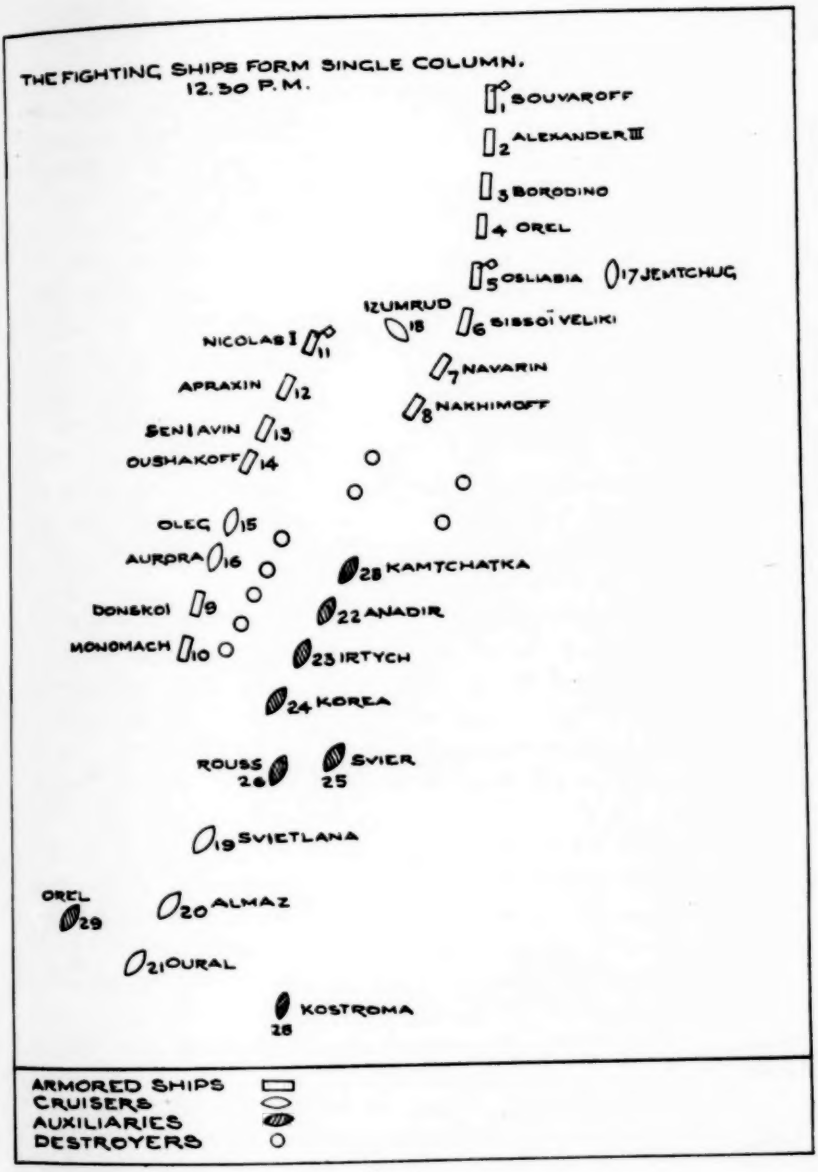

THE FIGHTING SHIPS FORM SINGLE COLUMN.
12.30 P.M.
1 SOUVAROFF
2 ALEXANDER III
3 BORODINO
4 OREL
5 OSLIABIA
17 JEMTCHUG
IZUMRUD 18
6 SISSOÏ VELIKI
NICOLAS I 11
7 NAVARIN
APRAXIN 12
8 NAKHIMOFF
SENIAVIN 13
OUSHAKOFF 14
OLEG 15
AURORA 16
28 KAMTCHATKA
DONSKOI 9
22 ANADIR
MONOMACH 10
23 IRTYCH
24 KOREA
ROUSS 26
25 SVIER
19 SVIETLANA
OREL 29
20 ALMAZ
21 OURAL
KOSTROMA 28
ARMORED SHIPS
CRUISERS
AUXILIARIES
DESTROYERS

FIG. 2.

again displacing the first division of his column to the right, so that the double column formation was reconstituted.

No formation could be more unfortunate; for when the Japanese naval forces, debouching by the north of Tsushima, came into contact with the Russian fleet, it was the left column, much the

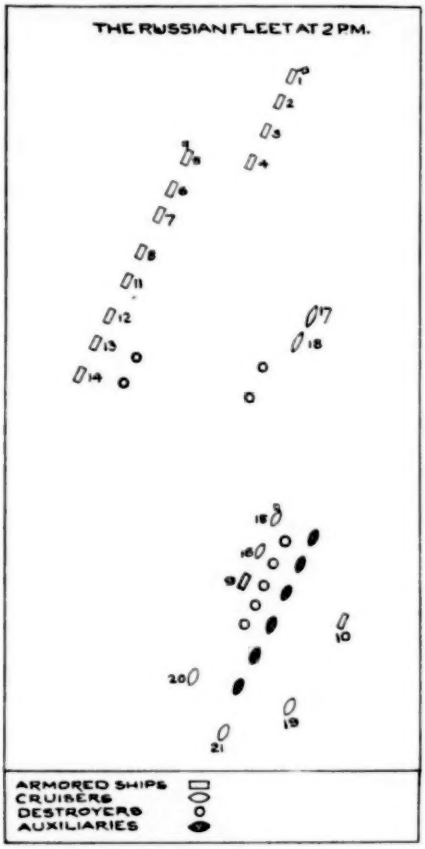


FIG. 3.

weaker of the two, that they could first attack, without the more powerful battleships of the right column, whose fire was interfered with by the interposition of the other, being able to reply energetically to the fire of the Japanese guns. And moreover, the battle once engaged, it would be very difficult to change so unmanageable a formation.

Quite otherwise was the Japanese order. Their fleet, divided into three *homogeneous* groups, of battleships, armored cruisers and protected cruisers, following the movements of the commander-in-chief, but each of them under the effective direction of its squadron commander, exhibited as much flexibility, by the development of three independent columns, as the Russians showed want of it in the manœuvers of their compact formation. Finally, to complete the wholly unfavorable dispositions of the Russians, the sun's position, in the direction of the Japanese fleet, prevented their making out accurately its movements, formation, and distance.

At the moment when the battle is about to open, the situation of the two squadrons is as follows:

The Russians in two columns; to the right, the *Souvaroff*, *Alexander III*, *Borodino* and *Orel;* to left, the *Osliabia*, *Sissoi-Veliki*, *Navarin*, *Nakhimoff*, *Nicolas I*, *Admiral Apraxin*, *Admiral Seniavin* and *Admiral Oushakoff;* the cruisers *Jemtchug* and *Isumrud* to the right of the two columns; astern, quite far off, the *Oleg*, *Dmitri-Donskoi* and *Vladimir-Monomach*, protecting the transports. The speed is from eleven to twelve knots (Fig. 3).

On the side of the Japanese fleet, the first and second squadrons in a single column, at first standing to the southwest as if to pass on a parallel course to the port of the Russian squadron, suddenly at 2.05 p. m. turn by head of column to the east, at a speed of 15 knots. The third squadron steers to attack the convoy from the rear.

At 2.15 the Japanese fired their first shots, though the Russians, on account of their excessive nervousness, had then been firing at them for some minutes at extreme range. At 2.45, that is at the end of a half hour, the fate of the battle could be considered to be definitely determined. In the artillery duel which took place between the two squadrons, at a distance always between fifty-five hundred and twenty-five hundred meters, the *Osliabia*, at the head of the left column, had suffered greatly from the intensity of the fire concentrated upon her; completely disabled, and having lost her commander, on account of her position as leader she threw into disorder the ships which were following her.

The relative positions of the two naval forces at 2.30 p. m. (Fig. 4) clearly shows the critical situation of the Russians.

The *Souvaroff* and *Alexander III* are on fire, the coast defence armorclads have scattered; there is no longer any order in the Russian fleet, which no effort thenceforth can save.

From this moment till the end of the day the battle will continue with alternating periods of relaxation and of renewed attacks, but

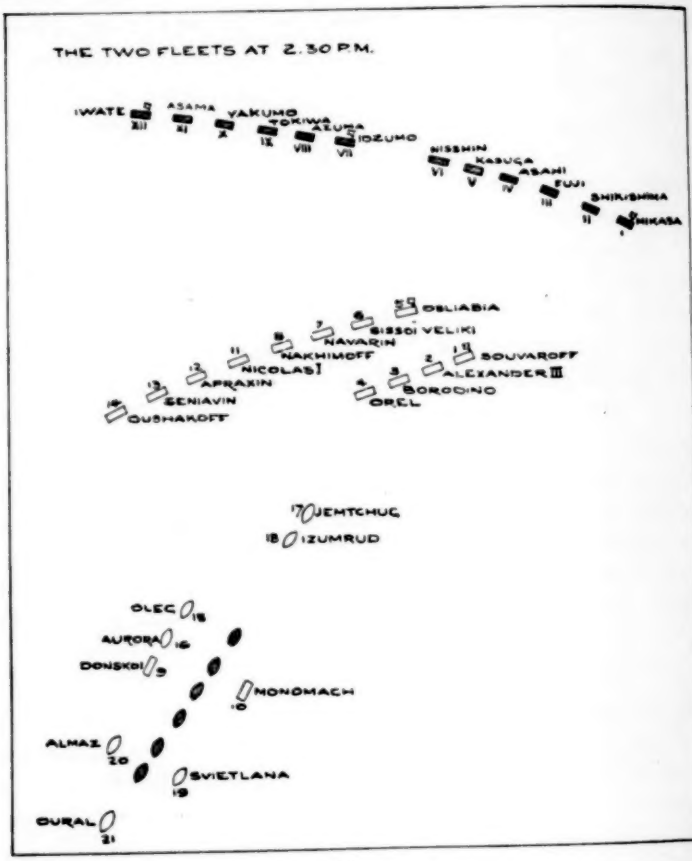


FIG. 4.

the mortal wound has been given. The Japanese keep up a speed of 14 to 15 knots, that of the Russians being 11 to 12; they follow a gradually changing course, seeking to get ahead of the Russian squadron. The latter follows this movement in a sort of passive resignation, changing its course correspondingly in the same direction. It irresistibly makes one think of the frightened gesture of

a child who tries to ward off, with arm bent above his head, his mother's punishment. The evocation of this tragic scene is frightfully sad. The Russians' torpor is such that the protected cruisers as well as the convoy, sticking obstinately to the tail of the column, follow all its movements with disconcerting tenacity, even undergoing the attack of the Japanese protected cruiser squadron through holding their position with a precision worthy of praise anywhere else than in battle.

At three o'clock the movement to get across its head of column has proceeded so far that the Russian squadron fears being caught

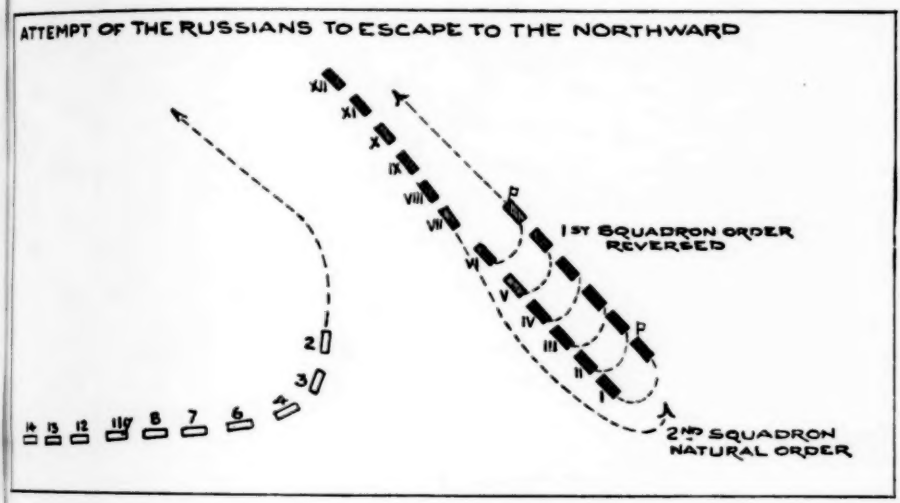


FIG. 5.

between two fires; it turns sharply to the north, in order to endeavor to escape by passing around the rear of the Japanese column. The latter performs a right about movement, in a particularly interesting way from the point of view of battle tactics, and finds itself again parallel with the Russian forces, upon which it once more gains, endeavoring to get in front and bar the way (Fig. 5).

The Russian's repeat their manœuver, this time turning to the east, at 3.45, and the Japanese immediately make a right about movement in the same manner as before (Fig. 6).

At 7.30 in the evening, after a momentary disappearance of the Russians in the fog and a renewal of the engagement, the destruction of the Second Pacific Squadron is almost consummated; Ad-

miral Togo orders the firing to cease. The *Osliabia* has sunk; the *Souvaroff*, a complete wreck, has met the same fate, having been finished by a torpedo from a destroyer; the *Borodino* has blown up; finally the *Alexander III* has capsized, as have also several other less important armored ships. (The sketch gives an exact representation of the battle.)

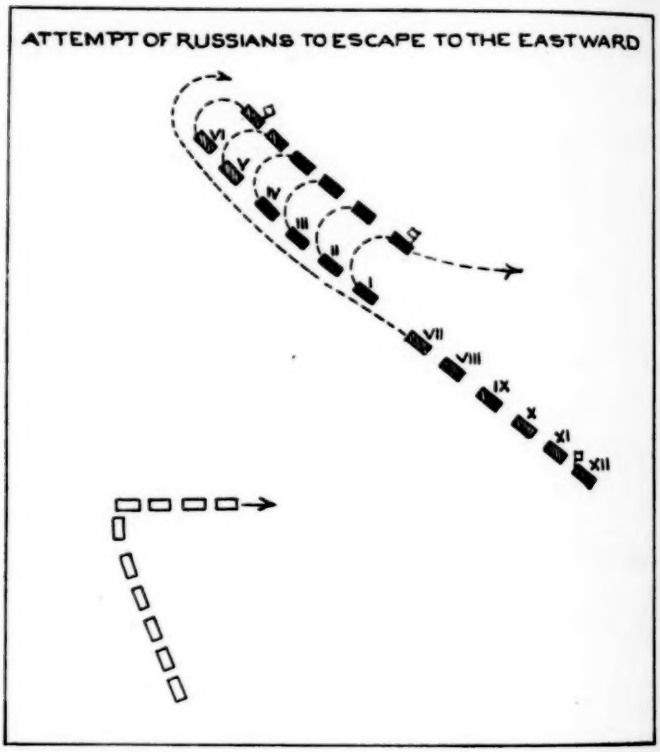
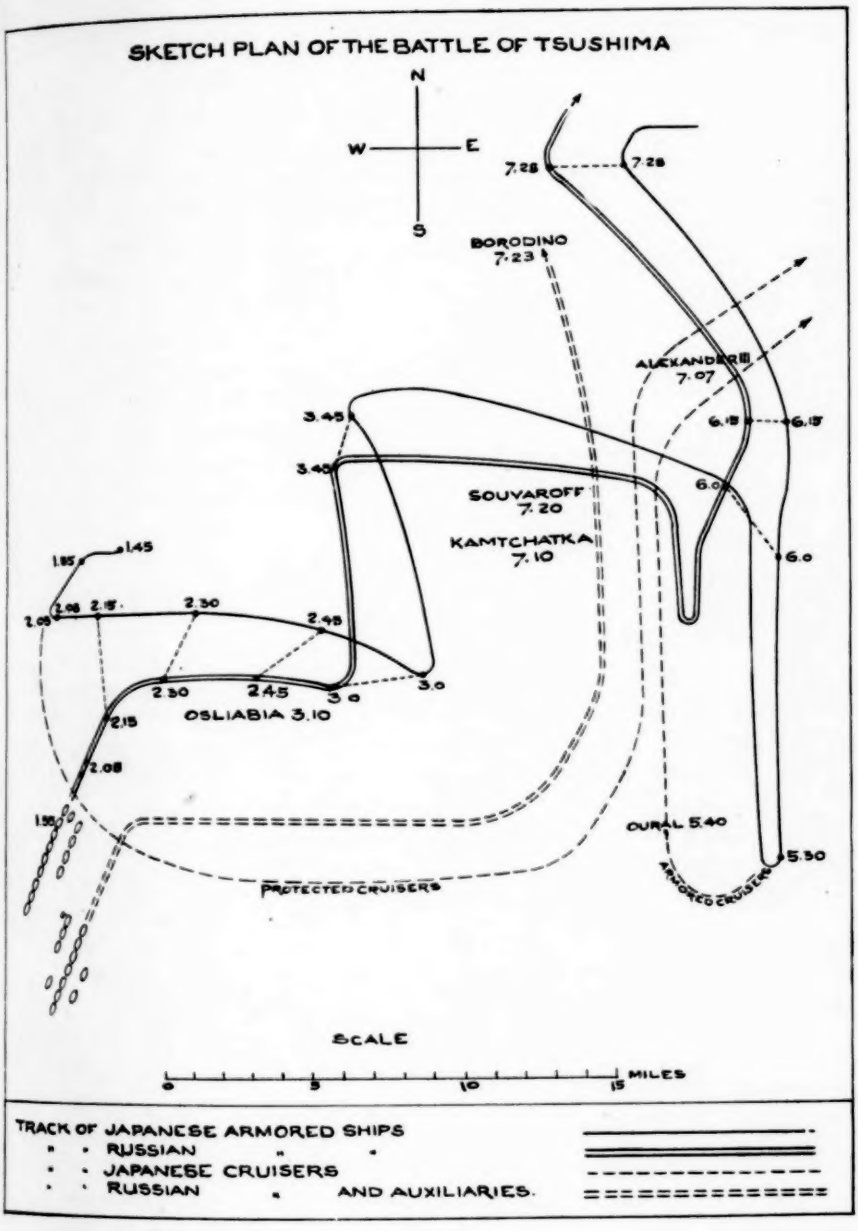


FIG. 6.

In putting an end to the action, Admiral Togo orders the flotillas to attack during the night. During the whole day, in fact, the torpedo-boats have played no part on account of the weather conditions, a strong breeze from the west and a heavy sea, which prevented their leaving the shelter of the coast. At night, the wind having fallen, they were able to put to sea in spite of a quite heavy swell. Their attacks lasted all night, but a study of them would have no great interest for us, since they were directed


SKETCH PLAN OF THE BATTLE OF TSUSHIMA
N
W
E
S
7.28
7.28
BORODINO
7.23
ALEXANDER III
7.07
6.15
6.15
3.45
3.45
SOUVAROFF
7.20
6.0
KAMTCHATKA
7.10
6.0
1.45
1.55
2.08
2.15
2.30
2.45
2.30
2.45
3.0
3.0
2.15
OSLIABIA 3.10
2.08
1.55
OURAL 5.40
5.30
PROTECTED CRUISERS
ARMORED CRUISERS
SCALE
0
5
10
15
MILES
TRACK OF JAPANESE ARMORED SHIPS
" " RUSSIAN " "
" " JAPANESE CRUISERS
" " RUSSIAN " AND AUXILIARIES.

against fighting units already mortally wounded and which they merely finished.

The following day, in the morning, the Japanese cruisers regained touch with the coast defence ships of Nebogatoff's division, which surrended at the first shot.

Thus was completed the destruction of the Second Pacific Squadron, and this time there was a final end to the Russian naval power in the Far East.

I have described only in broad outlines this battle of Tsushima, which has already made floods of ink to flow and will continue to do so for a long time yet: this has seemed to me to be sufficient. I do not believe, in fact, that all the wonderful things are to be found in this battle that people have wished, with a little too much imagination, to see in it. Some, with the enthusiasm of poets, have wished to establish a likeness between Trafalgar and Tsushima, to compare Togo with Nelson; that, in my opinion, is doing too much honor to the Japanese admiral.

A very lively imagination would be needed to compare the enveloping manœuver of the two Japanese armored squadrons, using their superior speed, to the wedge formed by Nelson's and Collingwood's squadrons at Trafalgar and intended to break through the center of the French-Spanish fleet. The reality is more simple. The Japanese commander-in-chief, discarding his timidity of August 10, this time advanced boldly to battle, and profited greatly by his boldness. He did it, moreover, without complicated manœuvers, without learned evolutions, in simple column.

One important fact dominates throughout this battle of Tsushima, and that is the artillery combat at long range. Better still than Punta-Agamos or the Yalu, it afforded proof that henceforth the gun is to be the sovereign arbiter of the fate of naval battles.

Furthermore, on this memorable day, May 27, 1905, which will be a notable date in naval history, the advantage derived from the development of modern rapid fire guns and smokeless powder was to bring about a result in accord with the immemorial and natural tendency of men to increase their fighting distances. I say that this tendency is natural; an artillery duel is, in fact, an eminently unstable state of equilibrium. Just as soon as the balance begins to turn in favor of one side, and a single lucky shot may sometimes be enough for that, this advantage rapidly increases at least as much by reason of the continuous weakening of the moral

forces of the adversary as by the material work of destruction which influences them.

It is important then, in the highest degree, to acquire *as soon as possible* that superiority of fire which demoralizes the hostile personnel by striking down everything round about it, and takes from it all strength to resist.

This conclusion is so unquestionable that since the battle of Tsushima an irresistible development, previously advocated in France, forces all navies towards the adoption of calibers of more and more power and of firing exercises at great range.

If a comparison must be made, it would be quite exact to affirm that, after the lapse of a century, the same errors have brought about the same disasters; that there is a striking analogy between the strategical or tactical ideas of Villeneuve and those of Rozhestvensky.

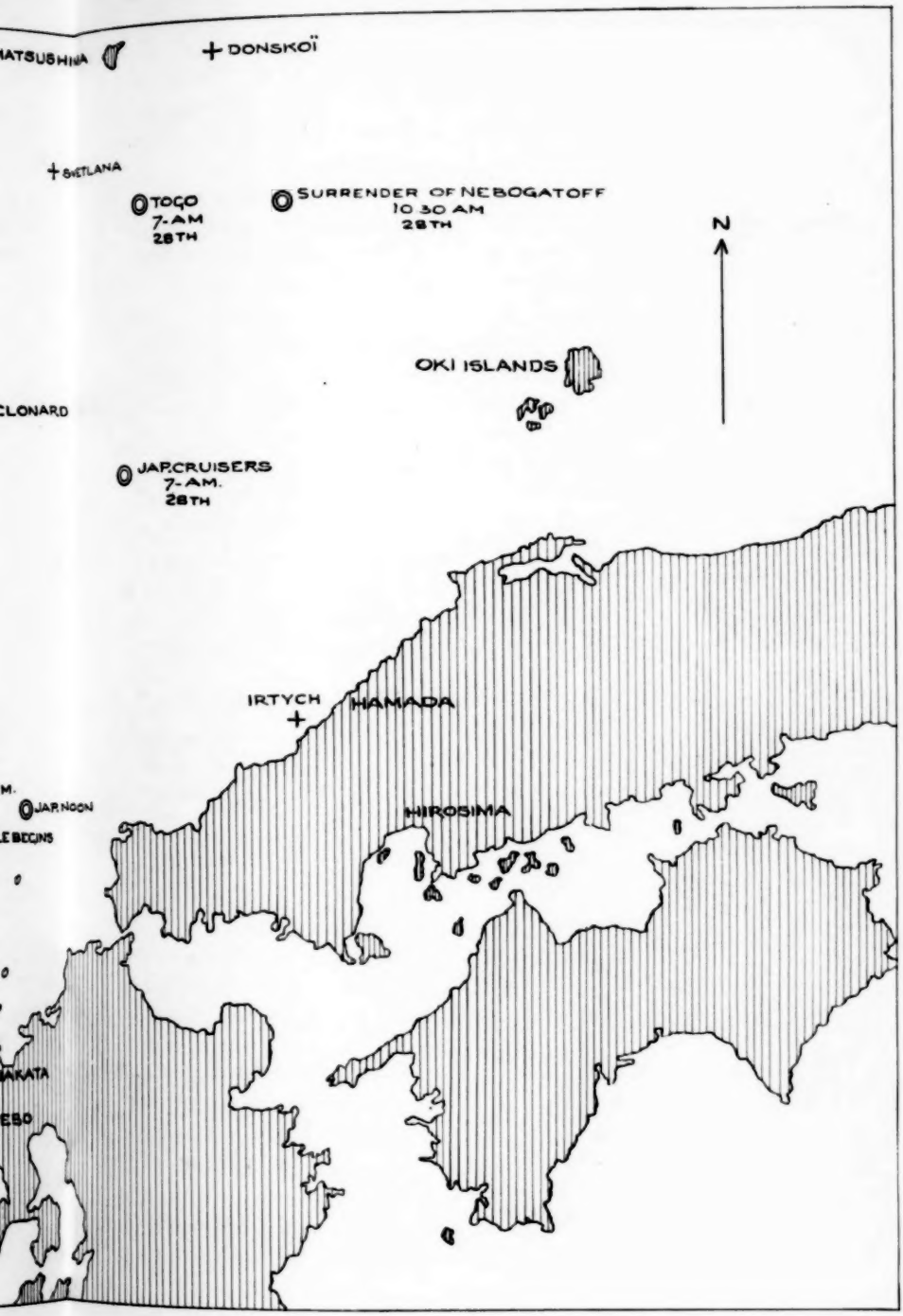
The two beaten leaders had, to the same degree, that inconceivable blindness which made them see their principal objective in the mission they had to accomplish; in the case of the Russian admiral, this preoccupation betrayed itself by an immense error whose consequences had a large part in the disaster of Tsushima. Fearing to lack coal with which to reach Vladivostok, he had so encumbered his ships with fuel that they were overloaded to the amount of fifteen hundred tons. Their narrow armor belts were therefore partially submerged, and this explains the capsizing as soon as breaches were made in the side above the armored deck. Finally, the presence of this fuel favored the development of the many fires which occurred on the Russian ships. Is it to be believed that if Rozhestvensky's mind had been fixed for a single instant upon the possibility of a battle, he would have put his ships in such a condition?

There is another resemblance between the unfortunate beaten one of 1805 and the one of 1905; both commanded hastily organized crews, without cohesion and without moral force, having received no preliminary instruction nor military training, and which had to fight against disciplined adversaries, accustomed to all exercises, above all excellent gunners.

And when we make a general survey of this war, perhaps too hastily analyzed, it is by that very thing that we can explain the causes of the Russian defeat. Surprised by a war unexpected only by itself, the government of that country carried it on, without

R = RUSSIAN FLEET
J = JAPANESE

BATTLE OF TSUSHIMA MAY 27-



OF TSUSHIMA MAY 27-28, 1905.

having prepared for it, in a state of constant and disordered improvisation. That is why their ships in the Far East burned the detestable Japanese coal, while the Japanese burned Cardiff. This example by itself is as good as long arguments.

The Russian ships, before the war, never had any gunnery practice, never any concerted exercises or manœuvers; the *Cesarevitch's* heavy guns were fired for the first time in the battle of August 10.

Never at any moment of the war did the Russian sailors reflect that instruments of war like their ships are made to fight with and have no other raison d'être. On August 10, just as at Tsushima, they had so little wish to fight that they maintained there also a formation in three columns, the cruisers to the left of the battleships, a formation bad from every point of view, since the cruisers received the projectiles which missed the battleships. Finally they returned to port with a large reserve of projectiles; more than three-fourths of their regular supply.

If these proofs seem insufficient, I will add that, in his instructions before the sortie of August 10, Admiral Vithoft declared his intention to return to Port Arthur, *if he could not reach Vladivostok without fighting.*

Such blindness, so persisting from beginning to end of the war, must bear fruit, and the best conclusion that I can reach in closing is that the study of this war, like that of many others which preceded it, will be above all useful to us by teaching us to profit by errors which we must not imitate.

The victorious force of Admiral Togo was made of the ineradicable weakness of the Russian sailors infinitely more than of its own worth.

Never be weak!

CHAPTER VI.

Résumé of the Lessons of History; the Objectives of War; the Rôle of Fleets; the Value of the Offensive; Blockade; Command of the Sea.

We have passed in review, in the preceding chapters, important historical facts to derive from them a philosophic lesson, from the special point of view of naval warfare. I should have liked to be able to give a great deal more time to these studies, for there is no more fruitful method of apprehending, and above all understanding, the military art. I will even say that there is no other method.

Only those who have never examined military questions can regard it as superfluous to connect existing problems with the experience of the past. Under the pretext that "means" have been radically transformed, they deny to ancient wars the very great influence which they really exercise upon those of to-day.

But as soon as the attempt is made, as we are bound to make it here, to throw a little light upon the numerous and complex subjects involved in preparation for war, it is quickly perceived that, under penalty of enunciating sentimental propositions which other exactly opposite sentimental propositions of equal validity can destroy, it is necessary to build upon a solid foundation, and this foundation experience alone can supply.

And it is for this reason also that, although I have been obliged to cut short the space given to the general teachings of history in order to follow my program, I do not thereby renounce the benefit which its lessons confer, and we shall take no step in advance, so to speak, without asking from them the support of their experimental confirmation.

The time has come to conclude, or rather to sum up, and in this connection it seems opportune to declare that I have no pretention whatever to innovate in these matters. I do not think I am wrong in expressing my conviction that no one of the distinguished officers who have before me discussed military questions has been able to differ in opinion from me on this subject. Our rôle, much more modest, is limited to seeking and recapitulating truths old

as the world, which all the great captains have made their own, which all the military writers of note have developed, perhaps under different forms, but identical in essential ideas. And it is precisely for that reason that it has appeared to me as impossible to take up the very subject of this work without a preliminary examination of military history as it would be to understand the actual state of contemporary Europe, for example, without knowing the acts by which it was constituted.

And, finally, till now my task has been a simple and easy one: to bring together the military teachings of the most famous specialists in the art of war, to set forth their methods, above all to let them speak, as it were, so that, though with my pen, it is really these practitioners themselves, of greater authority, who lay down the general principles of the art of war and make a vision of the future emerge from the past.

The exact end which I have proposed to myself is to diffuse in the body of naval officers those eternal principles the forgetfulness of which, too frequent by the French navy in the course of its long history, has always coincided with the worst disasters that have overwhelmed it. So limited, this task is already quite fine and useful, if it allows me to contribute even slightly towards making it understood that it is necessary to avoid such errors forever and always.

If the work thus far done has been well assimilated, many memories throng upon us when we think of it; certain terms, certain ideas above all present themselves to our minds with a special persistence: the principal objective, battle, destruction of the hostile naval force, etc., all these expressions, become familiar by dint of repetition, sound in our ears like the *leitmotif*, as it were, of this study of the wars of the past.

It certainly cannot be a mere coincidence that we always find identical principles underlying the ways of acting of all the great captains; for that reason alone we already have the right to believe that their successes have been due precisely to their agreement in the application of these principles.

Perhaps it might be objected that, having chosen only a limited number of historical facts, the choice may have unconsciously been made of those which correspond with a preconceived opinion and satisfy a personal theory. If the necessary and very useful study of history has been cut short, it is, I repeat, because the

necessarily small compass of the book imposed that obligation, however powerful the interest of the subject would have been; but it is the duty of all who may read my work to fill out its deficiencies by a personal study which I cannot too earnestly recommend. They will derive from it a very great benefit, and will find new reasons, I am entirely certain, to strengthen their judgment regarding the general principles which, from Alexander, Cæsar and Hannibal to the Japanese generals, not omitting Frederick the Great and Napoleon, have *always* led to victory. I scarcely need to state, moreover, that so far as I am concerned, I took up the study of the military questions which at this moment absorb our attention with the most complete sincerity and an entire independence of thought.

And, moreover, we feel that chance alone cannot be the explanation of the great warriors, of such various times, countries and temperaments, having obeyed like rules. When we add, on the other hand, that the forgetfulness or neglect of those same rules always coincides, in the course of our naval history, with our most painful trials, it seems difficult not to be convinced that there must really exist a general method of war, which all the great captains have used, whether in conscious imitation of their predecessors in the career or at the simple suggestion of their own genius.

When we observe, on the other hand, the persistence with which certain nations in the course of history have accumulated reverses by the use of the same confusing methods, we can but think, with Commander Daveluy, that "*though many people have made war, very few have understood it*," and since the occasion offers to speak of our comrade, I cannot too strongly advise the interesting and beneficial reading of his fine *Study of Naval Strategy*.

THE OBJECTIVES OF WARS.

We have seen, in the course of the preceding chapters, what idea Duquesne, Tourville, Suffren and Nelson, to speak only of the most famous, had of war. Their conceptions in this regard can be condensed in the classic formula, "*To seek the enemy, to come up with him and to beat him with superior forces*," and this sums up very well, in fact, the true conception of war.

Two nations go to war as a general rule about questions of self interest, disputed territory, rivalries of political influence or of economic supremacy. In the most frequent case, the belligerents

quarrel over a new possession which serves as a *pretext* for the armed strife; or still again, in the course of the events of war, they seek mutually to secure territorial advantages in order to bring the adversary to an agreement. Note well that this is only a *means* and not at all the object of the war. The latter is essentially limited to the intention, or the hope, of obtaining on one side or the other, by force, the result which persuasion or diplomatic negotiations have been unable to bring about.

To sustain their claims, nations have at their disposal various *forces,* military, financial, economic, moral, etc., which they oppose one to another, and it is thus that the idea of force arises as soon as the study of war is taken up; we shall concern ourselves only with military forces in this chapter. To be strong, still stronger, above all much stronger than the adversary, such briefly is the most efficacious means of conducting war to one's own best advantage.

And here it is important to have a clear understanding; the question cannot be one of force in absolute value. To lay down the principle that there is no possible success unless the totality of the military power of a country is superior to the totality of the military power of the enemy, would be to ascribe to war a much too simple character and to advance a proposition the falsity of which numerous historical facts have in advance demonstrated. It would also be to proclaim the deceptive axiom of the constant and sure triumph of brute force, as well as the immoral renunciation by weak nations of all hope of respect or even of independence.

When we speak of force, we mean *relative force,* that is to say the superiority of military power *at a fixed point* or under certain favorable conditions. The example of the Russo-Japanese war furnishes means of giving this thought the maximum of precision. If, in comparing at the beginning of this conflict and in their totality the war forces of all sorts possessed respectively by Russia and Japan, only their absolute values had been taken account of, there is no doubt that the prognostications would have been unanimously in favor of Russia, whose resources were incomparably the greater from every point of view. Thus the Japanese had in all and for all only the effective forces which they were able to bring to the front almost to a man during the war, about six hundred thousand men, while a general Russian mobilization, according to the most probable estimates, would have called to

arms an eight times greater number. And yet it is the Muscovite colossus, to use the well worn expression, who was vanquished in every encounter by his enemy, skilful in maintaining his relative military superiority at a point too far removed from the center of the Russian power for the latter to be able efficiently to bring into play the weight of his immense armament. It did not suffice that the theater of operations was connected by a way of communication to the reservoir of the total energy of the nation, if that way was too narrow. This is a too superficial view of that steel conductor, the Manchurian railroad, which exercised upon minds, in Russia and also in France, a dominating control, and imposed for so long a time, against all reason, the belief in final success. I would not for anything wish a straining after a scientific analogy to be seen in the comparison I am about to make; it must be taken simply as an image to help out language.

For a source of energy to be utilized at a certain distance, it is not enough that it have a high potential, it is further necessary that it be connected with the center of use by a conductor of sufficient section to give the required flow. The military energy of Russia had a very high potential; the conductor which was to transmit this energy to Manchuria had an insufficient section. The power delivered was always below the needs.

Thus then, in the case we are considering, it is the weaker people in absolute value which has seen victory crown its arms; but it obtained this result because it knew how to be the stronger in relative value, that is to say the stronger in every combat.

And such is truly, in effect, the objective of war; it can only be with a view to securing this advantage that war demands special combinations, a preliminary preparation, all things which would become superfluous if the numerical superiority of armies sufficed to give it.

It is with this order of ideas that the study of strategy and tactics, or better the study of the ensemble of procedures suitable to bring about this result, deals. The aim of strategy is to obtain this superiority at a point of the theater of war, that of tactics to have it at a point of the field of battle.

And why is this superiority of forces so much sought after? Solely because at all epochs it has furnished the most certain, as well as the most rapid, solution of all wars by the destruction of the weaker military power.

So long as the forces of the belligerents are intact, they represent antagonistic efforts which are in equilibrium; a single cause can produce the dissolution of this balance, that is to say the end of the war, namely, the destruction of one of those actions, the opposing one thereby becoming preponderant.

It goes without saying, in fact, that a nation which has no armed force left at its disposal is a nation at the mercy of the conqueror, since it no longer has any means of holding him in check.

And thus clearly appear the high value and the philosophy of the principles which, to speak only of naval matters, always guided Suffren and Nelson. These considerations explain their obstinacy in the pursuit of the hostile fleets, which they rightly regarded as the principal force to destroy. And this appears so reasonable, so evidently correct, that we may well ask how, in the course of our long naval history, those who directed naval operations have been able so frequently and so obstinately to remain blind to this truth.

Examples abound. There is Pontchartrain who directs Tourville to avoid the enemy's squadron in order to capture a rich convoy; there is d'Estaing who tries to take Saint Lucia instead of to destroy Barrington's squadron; there is also de Grasse committing the same error at Saint Christopher, finally there is the French government prescribing to Admiral Courbet the useless and difficult blockade of Formosa instead of consenting to that of Petchili, in the very heart of the Chinese power.

In all these cases, the same error is manifest; the secondary and material objective conceals from the eyes of those who know not how to make war the principal objective which must be followed in order to be successful.

Yet a very little reflection will make it clear that no territorial conquest is durable, that no result can be considered definitely achieved, so long as the forces of the adversary are intact, or even still active. The collision of the antagonistic forces is therefore fated to occur at one period or another of the war, and it alone, under almost all possible circumstances, permits the conflict to be ended. Logic itself indicates, consequently, that every effort should be made to bring it on as soon as possible, under chosen conditions, because it is the surest means of fulfilling the objects of the war. Whatever may be the motives of this war, political supremacy, extension of the zone of influence, territorial or eco-

nomic conquest, etc., is it not fully proved that those motives will be so much the better and quicker satisfied as the adversary shall dispose of no further reserve strength to oppose them?

All this seems the truth itself, and yet ignorance of it seems so deep rooted in France that in our time, and almost every day, there may be read in the newspapers, there may be heard echoed in Parliament, the affirmation, wholly based on sentiment, that squadron warfare would be for France a foolish thing, and that at any cost it must be renounced. It certainly might be renounced if, after we had really tried it, it had given us only mortifications. But it is sufficient to read history to remain unalterably convinced that we have experienced disaster because of having almost always avoided it, and that by means of it, on the contrary, Suffren shed the brightest lustre on our naval arms.

Admiral Rozhestvensky's magnificent naval foray has given rise to many controversies; though there has been a unanimous admiration of the remarkable seamanlike qualities of this flag officer, which enabled him to lead his fleet from Russia to the Far Eastern seas, under exceptional difficulties of all sorts, on the other hand there was much discussion, prior to Tsushima, as to his military objective. Should the Russian admiral have sought battle with the Japanese squadron, or should he rather have attempted to avoid it in order to reach Vladivostok?

In a published article, a French general officer of high authority has maintained the thesis that Rozhestvensky's objective ought to have been Vladivostok. This same opinion is clearly expressed in a document emanating from the General Staff, having the Russo-Japanese war for its subject.

There is no doubt that the chief of the Russian squadron thought the same; the cruising formation of his fleet when it entered the Korean Strait proves this superabundantly. The recollection of Nelson's memorandum then comes forcibly to mind, and a comparison is forced upon us. In the case of the illustrious English admiral, the formation adopted for cruising was the order of battle; the Russian admiral kept in cruising order, as he would have done in time of peace, in closely grouped columns, with his impedimenta of transports and colliers. The reason is that the latter did not seek to fight. If he had even had an idea of doing so, he would have sent away his convoy, which could not be of any use and which on the contrary was a danger.

Of these two plans, which is the good one? To judge only by results, one would already be able to conclude that the one from which came the triumph of Trafalgar is infinitely superior to the other which brought forth the disaster of Tsushima.

As far as I am concerned, I pronounce energetically for the first. And since we are discussing an example essentially of the present, I will say: The principal objective of Admiral Rozhestvensky ought to be battle; in the first place as a matter of principle, the destruction, even partial, of the Japanese naval forces being the most profitable result to attain and the most influential upon the destinies of the war; then as a necessity, the chances of escaping it being as small as possible, on account of the proximity of the Japanese naval bases and the narrowness of the passages leading to the only Russian base; finally as reasonable, this battle being the justification and the logical consummation of the immense effort undertaken by the Russian Empire to regain supremacy in the China seas.

D'Estaing, de Grasse, Brueys, and Villeneuve were beaten because they fought only when forced to; Rozhestvensky tasted defeat because he had to be dragged to battle. The sortie of August 10 from Port Arthur was a pitiable failure likewise because, even before they set out, the staff officers of the Russian ships were resolved not to fight. Suffren, Nelson and Togo were victorious because, on the contrary, they wished, sought for and prepared for battle. The same causes have produced the same effects.

And how can it be, after this, that in France certain cultivated minds still maintain the same error?

I shall not weary of repeating that it is the duty of all naval officers sustained by the study of war to uproot these ideas which periodically spring up in France with the vigor of vegetable parasites, and positively to implant the true doctrine of war by educating public opinion; such a result would by itself alone justify the foundation of the War College and make plain the immense service rendered to the country by the Minister of 1895-96.

In this connection, I must confess that in beginning this chapter I had some doubts as to its utility. For a moment I asked myself if I should not be accused of breaking through doors already open or of speaking platitudes, so evident do the propositions here set forth appear and so much the mere expressions of common sense.

I was reassured by the recollection of the persistence of certain errors and by the perception of the necessity of extirpating them.

So then, for us, the principal objective remains always the pursuit and destruction of the *enemy afloat*. This will be the solid and enduring foundation of our military edifice.

THE OFFENSIVE.

In writing the word *pursuit*, I thereby indicate the choice between two opposing methods of war, the comparison between which has given rise to long and warm discussions. I refer to the offensive and the defensive. With very few exceptions, which serve but to confirm the rule, the former is infinitely superior to the latter.

In his *Esprit des Lois*, Montesquieu says: "*The nature of defensive warfare is discouraging, it gives to the enemy the advantage of the courage and energy of the attack; it would be better to risk something by an offensive war than to depress minds by keeping them in suspense.*"

"*Fortunate the soldier,*" says Von der Goltz, "*to whom destiny assigns the rôle of assailant.*" And he adds: "*To make war is to attack.*"

And it is truly a fact that all the great warriors have adopted the offensive and by it secured their most brilliant victories; this may be understood, for the offensive gives to the leader who employs it, even before any action, precious advantages. Such a one knows what he intends to attempt, while his adversary is ignorant of it. He is master of his movements, of the time and of the place where he will carry on the action, and the action takes from these eminently favorable conditions a character of precision from which the adversary is unable to derive any benefit. To the latter everything is unknown; among all the plans that he can ascribe to his enemy, among all allowable hypotheses, which must he select? Taking into account the nervousness of public opinion, quick to be alarmed and to magnify beyond measure the dangers to which the country is exposed, it may be imagined how disagreeable must be the rôle of the military chief upon whom the defensive is imposed. One need not be much of a prophet to predict that at least in France, of all countries perhaps the most impressionable, this opinion, to-day a sovereign and exacting mistress, would not long endure the anxiety, the anguish even, of the prolonged waiting

which is the consequence of the defensive method. To understand why I am firmly convinced that at the end of scarcely a few days of enervating inaction the fleet would be driven out of harbor under the most unfavorable conditions, it is enough to recall the emotion roused in the United States, by the departure of Admiral Cervera's squadron for the West Indies, in the course of the Spanish-American war.

The fright of all the people of the American sea coast towns, who each day, and in each group of inoffensive steamships, saw the phantom squadron, throughout the period of its passage, proves to us that they thoroughly misunderstand our country who advocate, as is done daily, the policy, as fruitless as passive, of squadrons shutting themselves up in port.

Without giving an exaggerated importance to examples taken from the annual grand manœuvers, it is nevertheless allowable to observe that most frequently, I might say always, it is upon the side charged with attacking that the most brilliant rôle has devolved, as well as the easiest task.

And the superiority of the offensive is worth insisting upon, because it is particularly suited to the French character, to the temperament of this ardent and combative people; it is for that reason that we will agree with Admiral Bouët-Villaumez: "*The rôle of assailant, more suited to the nature of the French sailor as well as soldier, is then the one which an admiral ought to seek, and much more ought he seize upon it, if chance places him in the attacking position.*"

Observe, in this connection, that the word offensive is here taken in its broadest sense; it applies equally to tactics and to strategy, to the attack of a fleet on the field of battle and to its pursuit from the opening of the war, or to any other similar military action against the hostile forces.

The offensive method demands before all else one primary quality—activity; that which Alexander, Cæsar, Hannibal, Napoleon, Suffren and Nelson possessed to the highest degree. It demands great force of character on the part of the chief, with a tenacious will controlled by a great intelligence.

But that is not enough, this chief must have, to-day as of old, the instrument suited to this offensive war made up of energy and resolution. The idea of activity translates itself for us seamen by the expression *speed*.

Whether the matter at issue be to pursue the enemy, or to prevent, by a sudden attack which disconcerts him and defeats his plans, his own assumption of the offensive, it may be conceived what must be the primary importance of *time*.

The more rapidly the execution of the offensive is carried out, and the less the loss of time, so much the greater the chance of its being crowned with success. In war, to strike quickly is the first step towards striking hard.

In the field of naval strategy this signifies, once again, that *naval forces* ought above all to possess speed. When Nelson was pursuing with his well known vehemence, first Bruey's squadron bearing Bonaparte and his fortunes, then later on that of Villeneuve across the Mediterranean and the Atlantic, one single anxiety absorbed him to such an extent as to make him sometimes doubtful of his star: the delays which persistent contrary winds imposed upon him and the loss of time which resulted from them.

Is it not absolutely sure that in the eyes of the great seaman, in those moments, all which was not related to the factor *speed* must have seemed of quite secondary importance? On the other hand, is it not to the lack of speed of his fleet, due to the presence of several slow-sailing ships, that Villeneuve attributed the length of his passage from France to the West Indies, and the delays in the execution of the Emperor's strategic plan?

From whatever side the question is looked at, therefore, the idea of the strategic value of speed is forcibly impressed upon us. And, in fact, speed is above all a strategic quality. This statement is the more necessary to make because the initial preponderance of its rôle has been denied by some of our most eminent engineers, the authority of whose opinions does not permit leaving them unanswered. All taking the rather too narrow point of view of the constructor, they have brought forward the great cost of speed in the equation of the fighting ship.

The thorough discussion of this very important question cannot be introduced here. I will only observe that with a view to simplify it, to dispel certain of its difficulties and reduce their complexity, the learned naval architects lay down a principle to which they seem to wish to give the force of an axiom, namely, that from the moment that two nations go to war, one ought to conclude that they wish to fight, and that there is therefore no need of hav-

ing speed greater than that of one's adversary since, the latter equally desiring to fight, the encounter will necessarily take place.

It is not necessary to look very far in history to find facts which give the lie to this principle. Without going back to Villeneuve's campaign in the West Indies, and to so many others of the same kind, which prove how often an adversary can slip away and avoid fighting, the very recent example of the Russo-Japanese war is relevant to show us that a nation can very well submit to a war without any preparation and never seek combat.

The axiom crumbles away before the facts, and there is no occasion to be surprised at it. The question is not, in fact, to know if speed is costly and if, for the constructor, it would be worth while to reduce it. The problem is too restricted when so put; speed, strategically speaking, is indispensable, that is the only exact principle in the matter.

And outside of arguments based upon historical facts, it is difficult to see how, in the absence of the precious advantage of speed, an admiral could attain his principal objective, which ought to be to paralyze the hostile naval forces; in a word, to suppress the enemy afloat.

Two cases can present themselves in practice. First, the fleet whose destruction above all is sought may accept battle or be forced to submit to it, which comes to the same thing. This result is implicitly contained in the previous discussion of principle; it is of the highest importance to bring about the battle with the least possible delay, not only because it is desirable to secure as soon as possible the benefits of victory, or on the other hand to reduce to a minimum the evils of war, but also because such conditions of operating necessitate prompt conclusions. A single example will suffice; if *interior lines* are occupied, speed alone can give the ability to overwhelm one of the enemy's forces before he has brought about their complete concentration. Such would have been the case for the Russian fleet on August 10, if it had taken advantage of the division of the Japanese forces.

Second, the adversary may conceal himself and refuse battle; in this case, it is not clear how, if he has the greater speed, he can be forced, *immediately*, to submit to the encounter which he persists in fleeing from. Doubtless the hazards of fortune, especially on the sea, are very great, and can spoil the best prepared plans

by forcing to battle a chief who would have none of it, but chance ought not to be counted upon.

I do not at all forget that I have already many times shown, by historic examples, the impossibility of always refusing to fight. There always comes a time when the fleeing forces will be forced to battle (Huascar, Vladivostok cruisers, etc.); but this term, if other things are equal, will be so much the further removed as the assailant's speed is less. This condition, then, is not in accord with the exigencies of war, which demands, for many reasons of all kinds, as prompt solutions as possible.

If, on the contrary, one possesses superiority of speed, the adversary finds himself placed between the two alternatives only of accepting battle or of shutting himself up in port.

This is the proper time to define this question of speed, in order to leave no room for misunderstanding. We have taken pains to dwell upon the reasons which made us regard this strategical feature as an essential one. Those reasons are wholly derived from the necessity of seeking battle, and we cannot agree with those who on the contrary advocate speed for the purpose of flight. I read recently in a publication of no particular standing an article maintaining this strange principle, to which I would not refer had it not quoted, as a favorable argument, a speech made in Parliament by an important personage.

In a fine flight of eloquence in advocacy of speed, this orator reminded his hearers very justly that the French nation owed its most beautiful memories of military glory to speed; but he forgot to limit his argument to the fact that when, in the immortal campaign of Italy for example, Napoleon made such a wonderful use of it, it was to surprise the enemy and attack him, and that wherever speed has assured success it is only by *conducting to battle.*

Personally I value the teachings of history too highly to take exception to them, but it is necessary not to interpret them wrongly. And the quotation which follows is in exact contradiction to all the experimental facts of war: "*Suppose that instead of our clumsy squadrons imprisoned in their heavy Harveyed armor as were in their iron shells, during the decadence of the middle ages, those knights upon whom the leather clothed foot soldiers, the ancestors of our modern infantry, inflicted the disasters that we know of; suppose that instead of these clumsy squadrons we had fast ships, capable of avoiding their attacks, what*

would become of that empire of the seas so much talked about for these battleships?

"What is so pompously called the empire of the seas will be reduced to the narrow circle which that assemblage of fortresses called battleships traces on the immense surface of the seas with the range of its guns.

"And this assemblage may carry to and fro over the waters the mighty shadow of its armored walls and giant guns; but to what purpose, if the fast ships of the enemy, always capable of escaping from it, can carry everywhere where it is not, perhaps even within a few kilometers of it, menace and destruction."

I have given this extract, so foreign to the doctrines of war, to demonstrate once more how important it is to destroy, at least in the minds of officers, the ideas which are there expressed, and which are by no means new.

They are, moreover, it will be noticed, the exact opposite of those which are defended by the engineers of whom I have heretofore spoken.

Let us at once note that the second solution, which consists in staying in port, indicated by so many well intentioned advisers as the only possible course for the French fleet to follow, practically settles at one blow the principal problem of the war in favor of the assailant, and with the maximum benefit to him, since he obtains the desired result, which is putting the adverse forces out of condition to do harm, without any loss of material or personnel on his own side.

COMMAND OF THE SEA.

These considerations awaken in us the idea of the blockade and of command of the sea, two conceptions of exceptional value.

To have command of the sea, such is the expression familiar to all seamen which, in a concise formula, contains a world of ideas and thoughts, and epitomizes as it were the whole of naval strategy.

It does not signify only, for the victorious side, the definite conquest of the field of operations of war; it comprises also freedom of navigation, security of commercial transactions, circulation of the flag, all that represents the active life of a great nation, and which constitutes very often the object itself of the conflict. It is precisely so that it fully satisfies the necessities of war.

In the celebrated struggle between Rome and Carthage, have we not seen fortune waver from one to the other, following the fluctuations of their naval strength, to settle definitely upon the one which finally succeeded in conquering command of the sea?

This conflict originated in a rivalry for economic supremacy upon the sea; such supremacy was assured to the victor by the conquest of the supremacy of war fleets.

When we see around us all nations preparing formidable fleets, we cannot help establishing a relationship with the occurrences of the Punic Wars.

After centuries, this time again, the same causes produce the same effects. When the German Emperor pronounced that celebrated phrase: "*The future is upon the sea,*" he showed that he had a clear conception of the principles of war, and that a nation could not pretend to secure a world wide economic empire if it was not prepared, with the industrial and peaceful mastery of commercial fleets, to impose by force the mastery of military fleets.

There is the secret of the great effort made by Germany during recent years, to increase her naval forces.

It is also well to recall that, in the course of the unfortunate war of 1870, if the sea was always free for us, and by permitting us to prolong our resistance through the resources of all sorts which came by that way, helped to save the honor of France, it was to the uncontested superiority of our navy that the result was due.

The moment is favorable to decide a prejudicial question which has inflamed naval debaters for twenty years past. Although the discussion seems to have now lost much of its asperity, it is indispensable to settle it, because in spite of the luminous demonstrations of experience it still continues. For us, who have sought at their very sources the reasons for our convictions, the expression "command of the sea" immediately awakens in the mind the very clear perception that to exist this command must be absolute, that is to say be exercised through material forces, real and capable of triumphing over all obstacles, and among the latter must be counted those which sea-going opposes to the free use of fleets. The condition necessary for the conquest and conservation of a free maritime highway is therefore to possess *seaworthy* ships, fit to keep the sea in any weather. This requirement spells the incapacity of flotillas to fill this capital rôle.

For us seamen, who know how great the influence of the mass of a ship is in the constant struggle with the elements, who have learned by personal experience that the bigger a ship the longer she can stand up against heavy weather, this affirmation is an article of faith.

That it has, nevertheless, constantly been contested by those who had neither the competence nor the right to discuss it, is because the controversy has always been limited to the question of weapons. But the question is not to oppose torpedo against gun, as was attempted at each phase of the recent war; that is not it. Putting aside the question of weapons, what we must know is whether command of the sea can be won by flotillas.

And to this the Russo-Japanese war, besides so many others of the last and previous centuries, has replied with a precision which leaves no room for any possible controversy: the discussion is closed.

If at Tsushima the Japanese had had only torpedo-boats, nothing could have stopped the Second Pacific Squadron in the Korean Strait and in its passage to Vladivostok. And it is not because the Japanese naval forces would have been able to oppose only torpedoes to the Russian guns that this defeat would have been inflicted upon the Japanese, but because their torpedo boats could not face a sea which Rozhestvensky's ships easily confronted. This is what the disputants of eighteen or twenty years ago, and among them the most eloquent, Gabriel Charmes, did not comprehend when they dreamed of chasing great squadrons from the seas with mosquito fleets.

These theories are already very far removed from us, and I have only thought that they should be recalled because they seem to have taken on new life with the appearance of a more modern instrument of warfare, the sub-marine.

At each stage of the war in the Far East, a whole school, taking its wishes for realities, has proclaimed the superiority of sub-marines over squadrons. Unhappily for it, they were never at any time used. But certain illusions are so tenacious that, contrary to every experience of war and of sea-going, people have assumed to compel the French navy to have only sub-marines.

If such a decision could some day be taken, and upon this point I do not think that my personal opinion can be at all doubtful, on that same day our definite downfall would be consummated.

The sea can no better be kept with sub-marines than with torpedo-boats, no more than it was formerly kept with fire ships; they are all flotillas.

To command the sea, fleets are necessary.

In a more restricted portion of the sphere of operations of war, this command is no less indispensable.

If the principal, or even secondary, object of the war is conquest of territory, this carries with it an armed expedition, and consequently the transportation by sea of military forces to form the army of occupation of the coveted land.

This is what is commonly called, in military language, a combined operation. In an operation of this sort, the navy has the disagreeable part to play. Upon it devolves the protection of the convoy of troops during the entire passage; and that is a small thing in comparison with the protection of their disembarkation. It is not necessary to dwell upon the subject to make all the difficulties of such an undertaking apparent to seamen by profession. To prearrange the anchorage in a roadstead, most often an open one, of a fleet of transports, and to assure the absolute safety of the operations of disembarking numerous troops with all their campaign material, is an extremely arduous task. I mention only its main features, but they are enough to make evident the absolute impossibility of success without the no less absolute certainty of not being exposed to any danger of attack by the enemy.

The wide spread disorder and panic which the appearance of a hostile fleet in the midst of such an enterprise would produce may be imagined. The security which is indispensable is only assured by complete command of the sea.

And I have made no mention of the rigid obligation of assuring the communications of the expeditionary corps with their base of operations, a condition only attainable with the sea free.

As long as Admiral Cervera's squadron, keeping the sea, was a possible menace, the United States fleet attempted no decisive operation; as soon as the Spanish squadron was on the contrary shut up in Santiago, the expedition was decided upon and could set out from Key West.

If the Japanese had not won, from the beginning of the last war, entire liberty of movement, never would they have been able to carry out successfully the disembarkation in Korea of armies so numerous, amounting to six hundred thousand men.

It is interesting to note that the only serious cessation observed in this delicate operation, which scarcely ceased during the whole time of the war, coincided exactly with the awakening of activity which the unfortunate Admiral Makaroff was able to inspire in the Russian fleet of Port Arthur.

Finally, is it not because Napoleon was at no instant able to secure a free path, in spite of the wisest combinations of his genius, that he had to give up his project of invading England, and to confess himself later on vanquished by her?

The notion of "command of the sea" ought to be very definite; by this term supremacy over all oceans is not to be understood. England alone was able, strictly speaking, to cherish that megalomaniac dream some years ago; she herself is no longer able to pretend to it to-day. The expression applies solely to the maritime theater of possible operations.

This command of the sea, which plays thus in the development of every naval war so preponderant a part, can only be secured, I remind you, by two means: the blockade of the adverse forces in their ports, or the destruction of those forces in battle.

BLOCKADES.

The former of these means has been often used in the past; the history of our struggles with England furnishes many examples of it.

Among those best known, the blockade of Brest by the fleets of Cornwallis and those of Toulon by Nelson are justly famous. In our times, that of Santiago de Cuba by Admiral Sampson's squadron, and that of Port Arthur by Admiral Togo, give proof that the method is not obsolete.

And it never can become so, for if what we have said of the importance of a free sea is true, it is of the highest importance to invest the place in which a hostile fleet has taken refuge, not only thereby to deprive it of the power to act, but also to keep a close watch upon it and to be upon its track in case it should attempt a sortie.

Thus the plan of blockading serves two purposes; it enables one to realize the benefit of command of the sea without fighting and so without loss, and also, above all, to establish as close as possible a contact with the fleet which it is necessary to endeavor to destroy. The principal objective is therefore satisfied.

The case of Nelson, blockading Villeneuve's fleet, is remembered by all, and on this subject it is well to define with some precision the expression blockade. We do not mean by it only the operation which consists in surrounding the entrances of a port or roadstead with a cordon of ships so close together that no blockaded vessel can pass without being seen and fired upon. Such a conception would truly be too narrow and furthermore inefficacious, even if not too dangerous, nowadays.

By a blockade must be understood any stationing of a naval force at a distance near enough to the refuge of the hostile squadron to permit watching all its movements and to prevent its escaping from this watch by flight.

There is therefore a blockade whenever the circle of surveillance about the blockaded point is restricted enough to make the meeting of the two fleets, and consequently their engagement, certain. Such was the case formerly, in the days of sailing ships, as when Nelson, from his famous Agincourt bay, blockaded Toulon and the French squadrons as rigorously as if he had been on the coast of Provence. How much more so is it now, when improvements of every kind, the result of steam navigation, permit the removal of the base of operations of a blockade to a considerable distance! The introduction of wireless telegraphy on warships has overturned the practical conditions in this respect; thanks to this system of rapid communications over great distances, a blockade will be as effective to-day at a hundred miles distance as it could formerly have been at a very few miles from the blockaded coast.

We find the proof of this in the preliminaries of the naval battle of Tsushima, where it was a wireless message that warned the Japanese fleet of the approach of the Russian squadron and put it in motion at the right time to enable it to find the latter at the desired point.

This step in naval progress is so much the more important because the profund modifications in material and modern armament have made it absolutely necessary to increase blockading distance. The appearance of the torpedo-boat, followed by that of the sub-marine, have made it much too dangerous, in fact, to remain day and night in close proximity to a coast.

It may be said, in this connection, that the blockade of Santiago is not a representative case and ought never to have taken place as it did. The complete disorganization of the defence, the complete

military and naval anarchy of unhappy Spain, and the absence of torpedo-boats, or, more exactly, of such boats having *good* torpedoes, straight shooting and properly exploding, were necessary to afford the spectacle of an American admiral daring to station each night one of his battleships before the harbor mouth, and to do so with impunity.

The withdrawing of the enveloping line to a great distance, then, offers only advantages, since the means of surveillance and of communication are correspondingly modified.

It must also be said that it would be vain to seek to blockade so closely as to indulge the hope of preventing any escape of single vessels. At no period in history has there been a guard strict enough to stop a fast ship, commanded by an energetic and resolute seaman, knowing how to take advantage of all circumstances favorable to passing between the links of the blockading chain.

The "blockade runners" of the Southern fleet, during the war of the American secession, have left imperishable memories on this subject.

The blockade of Port Arthur was never strict enough to prevent some steamers or junks from taking supplies into that place.

There are still, in our time, fine chances for bold and brilliant manœuvering on the part of the commanders of modern high-speed cruisers, and there are enough moonless nights to permit discounting opportunities equally numerous.

Moreover the importance of the escape of a single ship must not be exaggerated; command of the sea will not thus be compromised for the blockading force. It is, in fact, the totality of the hostile fleet which, by the assemblage of its units, constitutes the only real force which it is important to watch and to blockade, always with a view to attain the principal objective, which is to force it to fight.

Thus is the question plainly set forth: immediate battle and blockade, in the broad sense in which it has just been defined, but unchangeable in its principles, are the two efficient means which assure command of the sea.

THE PRINCIPAL OBJECTIVE.

On examining the question, it is at once seen that in reality only the first of these two means is definite and decisive; the second can furnish but a provisional solution. And it is so true that battle is the real end and objective of every war that even those

who advocate for the French navy a passive waiting in port consider this inactivity a measure wholly for the moment and occasion; they point it out as the means of awaiting a "favorable opportunity." They usually neglect to define what constitutes such a favorable opportunity.

The neglect is not accidental, for these exceptional circumstances, by the firm but delusive hope of which they are deceived, are not easily imagined.

I understand very well that, in this solution, there is seen the tempting image of a relaxation in the watch of the blockading forces, of a conjunction of weather and the elements accidentally scattering those forces, in a manner to reverse the rôles and give to the besieged superiority of numbers.

It is very necessary, in reasoning thus, to count upon the favorable chances, for the very definition of the blockade leaves no room to doubt that the fleet employing it is composed of very superior forces. To judge of the practical value of such hopes, the history, so constantly fruitful in teachings, of the naval war of 1805, and particularly the correspondences of Nelson and Villeneuve, must be attentively read.

They also, in the French fleet, counted upon the benefit of bad weather breaking the rigid circle with which the English fleet hemmed them in; it is well known what the result was of that first sortie of January 18, from which the French ships had to return to port half wrecked by a violent storm from the southwest, so much the worse for them because the long-continued idleness in which they had lived for months in the Toulon roadstead had unfitted them to encounter it.

The English fleet, for their part, wonderfully trained by enduring the trials of a long blockade, went through this tempest without damage or injury. "*Instead of putting to sea in spite of the English squadrons, forcing a way if necessary,*" wrote Admiral Jurien de la Gravière, "*they preferred to wait until a gale of wind compelled the latter to raise the blockade. They went out then favored by a storm, and more than once that storm gave them no opportunity of doing anything against the enemy.*"

This method has verily been too unsuccessful for us in the past not to be given up in future.

Villeneuve certainly succeeded, in his second attempt on March 29, in escaping Nelson's watchfulness and breaking the blockade.

But this was only an absolutely secondary episode of the great military drama whose conclusion, logical and unimpeachable as far as the principles of war are concerned, was to be Trafalgar, that is to say *battle.*

At Santiago de Cuba, the sortie of unfortunate Cervera's squadron, had it been successfully accomplished, would only have delayed by a few days the final result. So too the naval battle of August 10, which marked the first Russian naval disaster of importance, was but the material and logical consecration of a defeat virtually accomplished from the day that the superior naval forces of the Japanese blockaded the Russian squadron in Port Arthur.

In a document on the subject of the Russo-Japanese war, drawn up by the General Staff, I find this expression: "*If Rozhestvensky had been able to reach Vladivostok with his fleet intact, this accomplishment could have been regarded as equivalent to a victory. In the shelter of a safe harbor, having at his disposal docks and coal, he forced the Japanese to wear themselves out by hard cruising, and kept himself, as a perpetual threat to their communications by sea, master of the choice of the hour when it would suit him to engage in battle.*"

Is it not curious to again find, after the lapse of a century, the same proposition which attributed to the French fleets snug in harbor better preparation than that of the enemy's forces at strife with the sea. We know only too well what to think of it.

Villeneuve said to his sailors: "*Nothing ought to astonish us in the sight of an English squadron, their ships are worn by a two-years' cruise.*" That which he also believed to be a "hard cruise" was in reality the wonderful school of experience, where by enduring the bitter trials of sea life, characters were formed and with them the incomparable instrument which Nelson was to use so well.

If Rozhestvensky had been able to reach Vladivostok, he would have been immediately and closely blockaded by the Japanese naval forces, and the final result would merely have been postponed.

Command of the sea was assured just the same to the Japanese by this blockade, and on the fatal day when, under the impulsion of events or of public opinion, the Russian naval forces, depressed by their long enforced inaction, resigned themselves to going out, they would have found opposed to them warlike fleets, inured to

all the hardships of cruising, impregnated with that profound seaman's sense which constant sea experience alone can give. They would have been beaten in the same manner as they were at Tsushima and for the same reasons.

It is thus that indispensable history, ancient or contemporary, teaches us, with unescapable logic, that war can have no other effective sanction than battle.

Whether it be a little sooner or a little later, at the beginning or at the end of the war, battle is unescapable and the moment will inevitably come when the *two antagonistic forces* find themselves face to face.

To speak truly, from the moment that these forces are in sight of one another the rôle of initial preparation for war effaces itself before that of the commander-in-chief.

The hour is about to sound when the heaviest responsibilities accumulate upon the head of a single man, and when the wisest plans, the most minute precautions, the most legitimate hopes, since they are based upon foresight, may be annihilated, if that man does not measure up to the occasion. Strategical conceptions give way to those of tactics.

At the point which we have reached, must we then be forced to this somewhat discouraging conclusion that at the instant of engaging the presence of the man of genius is indispensable, and that in his absence all hope must be abandoned?

Whatever may be the help that the presence of such a chief could bring to his fleet, it is wiser to count without him. The attentive study of the *way* of great seamen in the past is particularly reassuring in this respect, for it enables us to perceive that there exist a certain number of principles, if not a method, inseparable from success.

In carefully examining them, we shall not be long in recognizing them, for they are identical upon all points with those which the necessities of a strategical order have lead us to lay down.

Here in fact are represented the first two terms of the classic formula laid down at the beginning of the chapter.

"*To seek the enemy, to come up with him . . . .*" There remains "*to beat him with superior forces.*"

Must we understand this to be a mere numerical statement, signifying that to a fixed number of hostile ships it is needful always to oppose a greater number of ships of the same kind?

If an affair so complicated and so difficult as battle is could be reduced to a simple question of arithmetic, the most magnificent feats of arms which have illustrated history would have to be stricken from its records.

Disregarding the many examples in military wars where Alexander, Hannibal and Napoleon beat hostile armies most frequently more numerous than their own troops, it is particularly interesting to observe that at Trafalgar, as well as at Aboukir, Nelson was inferior in numbers and yet carried off the victory each time —and what victories!

Just as, when we examined the general principles of war, we were led to conclude that the important thing is to be stronger than the adversary at one definite point of the strategic game board, we will now say that the superiority of forces which it is essential to seek and to obtain, on the field of battle, should be at one definite point of that field, over a fraction of the adverse forces; once more we come upon the notion of *relative* superiority.

But before going more deeply into this subject, there is another principle which more pressingly invites our attention. The question is once more of the choice to make between two methods of fighting; the offensive and the defensive, and the question is hardly proposed before our choice is easily devined. It is useless to renew all the arguments that I have already developed in support of the first method when the question was of seeking the enemy and forcing him to battle; the whole weight of those arguments can but be increased when the question becomes that of fighting him. The rôle of assailant possesses inherently too many moral advantages of all sorts for its renouncement to be thought of. Yet, whatever the strength of the argument, it would not be sufficient to enforce conviction, if the relentless teachings of the past did not remind us that our most grievous reverses upon the sea have been the fruit of our passive method of making war. Far from seeking combat, we have most frequently only yielded to it.

In this connection, the words of Admiral Jurien de la Gravière cannot be too much pondered: "*If the names of some of our admirals are to-day so sadly associated with the memory of our disasters, the fault, let us be sure, is not at all wholly theirs. Rather must the character of the operations in which they were engaged be accused, and that system of* DEFENSIVE *warfare which Pitt de-*

clared, in Parliament, to be the precursor of inevitable ruin. This system, when we wished to renounce it, had already become habitual to us; it had weakened our arms and paralyzed our confidence. Too often our squadrons left our ports with a special mission to fulfil and the intention of avoiding the enemy; to meet him was already an adverse stroke. It was thus that our ships presented themselves to battle; they underwent it instead of imposing it."

". . . . For a long time this restricted and timid warfare, THIS DEFENSIVE WARFARE, *could be kept up, thanks to the circumspection of the English admirals and the traditions of the old tactics. It was with these traditions that Aboukir broke; the time of decisive battles had come."*

Among all the examples that could be selected, that of Aboukir certainly affords the most striking contrast between the two methods of fighting. On the French side, there is the defensive in its most indolent and depressing inactivity; the squadron is at anchor, already by that single fact in a notable state of inferiority since it is unable to manœuver. Moreover, it is without proper lookout service, so that the news of the approach of the English fleet surprises it in full disorder; and virile resolution is to such an extent wanting to its leaders that but a single voice, that of Blanquet du Chayla, is raised, without success, to demand that they fight under way.

This picture of a fleet at anchor, letting another fleet full of life and ardor come upon it, does it not appear as the very symbol of passive resignation, of the defensive method in fine?

If this were an isolated example, perhaps the value of the argument based upon it could be contested; but did not the naval battle of Sluys, several centuries before Aboukir, itself also have as a characteristic the complete defeat of the fleet which accepted battle at anchor?

This result cannot be surprising, for the idea we form of fighting is inseparable from that of action; and, to repeat it once more, a naval force which is incapable of manœuvering, and which awaits, moored to its anchors, the adversary's attack, is not an acting force.

Quite otherwise is the appearance on the side of the English squadron; here everywhere is combative ardor, from the commander-in-chief to the last sailor. Each one knows where he is going and what he has to do, so that all efforts tend to a single

object and work with an irresistible force. This is the offensive spirit in the full acceptation of the term and of the idea.

Signals are useless, and only the strictly indispensable minimum of these are made, for Nelson's captains have long known his plan; they know that he will seek to crush one wing of the French squadron "with superior forces." It will be, in the case of the battle of Aboukir, the head of the French squadron which will thus be crushed by superior effort, the turn of the rear of the line being to follow.

Furthermore, if Nelson knew how to apply this principle with incomparable mastery, it is not his invention. Ever since the legendary tactics of the Horatii, to repeat, a great number of their imitators, at all stages in the world's history, have striven, by skill or cunning, to beat in detail adversaries whom they could not overcome all together.

Without going outside of purely naval actions, we have seen Suffren adopt this same tactics, seek to attack a fraction of the opposing fleet with the whole of his own forces, and endeavor to obtain thus, *at one point* of the battle field, numerical superiority. In the English navy likewise, Rodney, at the battle of Dominica, had already cut the enemy's line in such a manner as to throw it into disorder, dislocating it as it were, and to bring between two fires a portion of that line.

An English writer, Clerk, a great admirer of Suffren, has laid down, in an epoch-making work, a whole body of doctrines based on these tactics which Nelson was later himself to adopt. Recently, Admiral Togo, at the battle of Tsushima, attacked the Russian squadron in a manner which strikingly resembles that of the English fleet at Trafalgar. The two Japanese squadrons, or more exactly their fleet divided into two squadrons, crushed one part of the Russian line, as the two squadrons of Nelson and Collingwood did in the case of the allied fleet, not choosing the same part, nor attacking in the same way, but under the inspiration of the same principles, which alone are important.

In truth, this method does not belong exclusively to any great chief; it is as old as the world, and I am tempted to say that it derives solely from good sense. If it was lost sight of, at least in the naval wars which immediately preceded the campaigns of Suffren and Nelson, if, for a very long time, a naval battle was looked upon only as an engagement, in a way academic, between two

columns correctly opposed one symetrically to the other, this momentary neglect of the true principles of war takes away nothing from their force.

In the work of which mention has already been made, Clerk points out the special importance of bringing a squadron into action in such formation that the units can mutually support each other. This point of view is certainly correct; it is wholly contained, moreover, in the offensive program which exacts, for success, a perfect union of efforts, directed towards a single object.

It is this program that the French navy has so rarely made its own; for proof of it I would wish nothing but that interesting remark made by Mahan that the French fleets have almost always engaged from *to leeward;* it is this same program which it is indispensable for us to adopt definitely in order to break away from the old ways which have led us only to mortifications.

Though tactics changes as to its procedures, it does not follow that its principles change. Doubtless in the time of sailing ships the weather gauge had an inestimable value which no longer exists; but that is only one detail which another detail will replace.

In our time, for example, it is the sun gauge which it is necessary to struggle to obtain. If the sun is reflected back from the adversary, all the details of the targets are brought out clearly, and the aim has a precision which becomes, on the other hand, impossible when it is directly in the eyes of the gun pointers. It is thus that at Tsushima Admiral Togo secured for himself this one advantage more over his enemy.

It is not enough, finally, to have overcome the adversary, to have compelled him to cease fighting and to retreat, it is necessary to annihilate him, to destroy completely the power that he represents, and there is but one method of doing this; pursuit, a furious, implacable pursuit, giving neither respite nor repose to the remnants of the beaten fleet. To a fleet thus harassed, no hope of renewing its strength is any longer left, and that alone responds to the aim of the war.

Any other method leads but to half victories, which are not rigorous solutions and remain too often sterile.

I would not wish any possible misunderstanding as to the scope of the chapter I have just written; and, in this respect, it is not superfluous to return to a certain statement made in the introduction itself of the present work.

There must not be seen, in the exposition which has just been made, the least pretention to a doctrinal teaching of victory; that, I repeat, cannot be taught. The sole legitimate ambition in this matter ought to be and is, in reality, to co-ordinate, as we have, the lessons of history; to make a classification of the methods of war used in the past and to show which of them have been crowned with success.

Such a work is legitimate, for it permits of bringing out clearly a quite small number of fundamental laws of which it is exact to say that their neglect means certain failure.

Doubtless, once more, nothing can take the place of a good general; but, other things being equal, the latter will be so much the more certain of victory as he follows, in a general way, the method of the most illustrious warriors among his predecessors.

Upon the field of action, the more convinced he is of the necessity of striking at his enemy's weak point, the more easily will he discover that point.

But let us not be deceived here; this method, which we have broadly outlined, exacts a long and methodical preparation, leaving to chance and circumstances only the minimum part.

To maintain formidable forces, to discern the vulnerable point of the adversary, to carry there rapidly the maximum possible effort to obtain at that point superiority, such is the rôle of strategy and, consequently, of the General Staff.

To watch closely the opposing forces of the adversary, to compel him to battle, to discover the weak point in his formation, and to bring the whole of one's own forces to bear upon that point, that is the rôle of the tactician, that is to say of the commander-in-chief.

Both are grandiose in their conception; the first, the more abstract, admits, as we shall see later on, of as many different methods of execution as there may be nations at war; the second is of more general application. But the second exacts also a perfect understanding between the commander-in-chief and his subordinates. There ought to be no secrets between them, and the thought of the general ought to become that of all his captains.

A single object ought to guide them—battle; and it is for that reason also that during the period of search for the enemy everything ought to be planned as if that battle might take place at any

instant. This implies that "the order of cruising is to be the order of battle."

Finally, as a consequence of the requirements above set forth, once battle is engaged, signals become useless: "honor to whomsoever does the best."

"*The admiral-in-chief ought as much as possible,*" says Admiral Bouët-Villaumez, "*foresee before the battle the manœuvers to be made; and once fire is opened, the captains ought to be so much under the influence of their admiral's methods of attack and his intentions that signals cease then to be necessary for their guidance.*"

I have only, in finishing, to emphasize how chimerical it would be to wish to make war without taking risks. War is a game in which there is no more certainty of winning than there is in any other less serious. "*Who risks not, gains not,*" says an old proverb.

If one does not wish to take the chance of losing, there is but one way, and that is not to play; yet when the question is war one often is obliged to play despite himself.

Therefore is it not infinitely more reasonable and more wise to learn to play well that game? Thus will the chances of loss be reduced to a minimum.

On September 14, 1804, Napoleon wrote: "*All the over sea expeditions which have been undertaken since I am at the head of the government have failed, because the admirals saw double and found, I know not where, that war can be made without running any risks.*"

Suffren and Nelson, in their correspondence, have also made known to us their ideas on this subject; they are worth meditating upon. That is why I do not think I can better conclude all that precedes than by recalling one of Nelson's professions of faith which I have already quoted: "*I should very soon either do much, or be ruined. My disposition cannot bear tame and slow measures,*" wrote the most illustrious of English admirals, after the battle of March 14, 1795, against Admiral Martin's fleet. These words contain a whole program.

CHAPTER VII.

Proof of the Existence of a Body of Fundamental Doctrines; Opinions of Military and Naval Writers.

The conclusions of the preceding chapter, wholly drawn from the impartial study of military history, derive their value from the experimental method which furnished them; they are therefore self-sufficient. But the question is too important and far-reaching for me to hesitate to increase their persuasive force by arguments borrowed from the most clearly competent military writers. In thus depending upon *authors* to justify my own opinions as to the general teachings of great wars, I anticipate the objection which could be made to me of having chosen among the facts and of having examined them from a somewhat too personal point of view.

And just as it seemed to me beneficial to study some great examples of land wars before taking up naval wars, so I shall first pass in review the ideas formulated by some military specialists and then finish with naval authors.

This general method is once again legitimate, for there is really but a single and unique doctrine of war. If we will only reflect upon the subject of war, we will recognize, in fact, with Clausewitz, that it is nothing but the violent procedure by which one seeks to compel the adversary to yield to one's wishes. To obtain this result, it is necessary to call upon *all* the forces at one's disposal in order to make the greatest possible effort. Thenceforth, those various forces, military, naval, moral, etc., appear but as different means of attaining a single object; there can therefore be but one single strategy, and every conception which tends to establish a distinction between the utilization of military forces and that of naval forces, in a word to differentiate naval strategy from military strategy, is purely arbitrary. This principle of unity extends from strategy even to tactics; infinitely more varied in details (for it necessarily feels the effects of the incessant developments in weapons, as we have had to state on many occasions), nevertheless tactics also obeys unchangeable laws.

JOMINI.

In Jomini's eyes, the art of war is wholly contained in the principle of the quest of superiority of forces at a decisive point. The objective of strategy is the concentration of the bulk of one's forces upon a point of the theater of the war, just as in the theater of active operations tactics endeavors to bring the bulk of one's troops to bear upon a weak point of the field of battle.

For him likewise, the offensive is in its general principle advantageous. It exercises a preponderant influence on the morale of armies; it is beneficial furthermore from the advantage which the pursuit of a well determined object gives. If this writer, nevertheless, seems to attribute to the defensive method a partial superiority because it gives the choice of the *place* of operations, it is on the express condition that it be *active,* for he explicitly condemns every passive form of the defensive. But what then is the active defensive; that is to say the defensive which contemplates attacking at a favorable moment, if not a particular form of the offensive?

"*A state attacked by its neighbor,*" says he, "*which claims ancient rights over a province, rarely decides to cede the latter without fighting; and from pure conviction of the reality of its rights it prefers to defend the territory that is demanded of it, which is always more honorable and more natural. But instead of remaining passively on the frontier awaiting its aggressor, it may suit it to take the initiative or offensive.*"

He says likewise: "*Let us recognize that a State does better to invade its neighbors than to let itself be attacked.*"

And in this connection, it may not be useless to explain that in forcibly advocating the principle of the offensive, I have never meant to advise blind attack, head down, under all circumstances and in all places, but rather the aggregate of well-planned active operations, directed against the enemy's weak point; and this requires of necessity preliminary profound study of the latter's military constitution. Finally I have wished above all to contrast the fruitful method of action with that of resigned waiting, which leads surely to defeat. This is Jomini's idea, which he expresses in the following manner in the chapter on tactics entitled "Of the defensive offensive": "*We have already pointed out, in speaking of strategic operations, all the advantages which the initiative gives; but we have recognized at the same time that in tactics the*

one who waited could turn all these advantages to his own account, by a timely change from the defensive to the offensive. A general who awaits the enemy like an automaton, without any other plan than to fight bravely, will always succumb when properly attacked. It is not so with a general who waits with the firm resolution at the proper moment to fall upon his adversary in order to regain the moral advantage which comes from an offensive movement and from the certainty of putting one's forces in action at the most important point, which is impossible when keeping strictly on the defensive."

He equally proclaims the necessity of an army's possessing a base of operations, from which will come to it the re-enforcements and supplies of every nature indispensable to the maintenance of its vigor, and which is the support of its offensive action. This base is not always single; it can and ought to be completed by the organization of secondary bases, in proportion as the offensive operations of the army separate it from its principal base.

We have already seen, in studying the events of the Russo-Japanese war, the application which the Japanese fleet made of this excellent principle laid down by Jomini. Certainly the arsenals of Japan might have been thought near enough to the center of naval operations, and yet Togo did not hesitate to adopt on the Korean coast a base in more immediate contact with what was going on. And since we are alluding to a naval example, it is of interest to note the formal condition put by the general whose military ideas we are now discussing upon the adoption of the sea as an army's base of operations. He states, in effect, that the concomitant necessity of command of the sea is a somewhat disadvantageous condition.

It seems difficult to reproach this doctrine, from the pen of such a man, with having been inspired by the necessities of a cause or a theory; it adds remarkable force to all that I have already insisted upon in the exposition of the situation of the opposing sides at the beginning of the war which has just taken place in the Far East. It also puts in relief how much the Japanese, in contradistinction to their adversaries, were permeated with the fundamental principles of the military art.

General Jomini, moreover, did not pretend to compress the theory of war into a sort of abstract formula applicable to all cases; very much to the contrary he regarded war not at all as a

science based upon more or less ingenious mathematical speculations but as a drama with all the passions, all the sublimities and all the weaknesses which attend that crisis of humanity. It would be difficult to indicate more clearly the considerable part played by moral forces, interpreted broadly, in the progress of the destinies of a war. At each stage of the Russo-Japanese war we could in fact see the scenes and acts of this poignant drama in the course of which the moral weakness of the Russians furnished us with living examples much more convincing than those taken from fiction.

This moral conception of war is worth remembering, for it implies the indispensable knowledge of the enemy's state of mind, of his degree of preparation for the struggle, and thus shows the close bond which, at the outset of any strategy, ought to exist between the general policy of a country and its purely material preparation for war.

Analyzing Napoleon's system of war, the definition of which can be summed up in three words—speed, battle, rest—Jomini thinks that this system will never be abandoned. I may add, for my part, that it owes its wonderful vitality to the excellence of the principles upon which it is based; though Napoleon knew how to make a marvelous use of them, they really were not exclusively his own. We have seen, although a little too briefly, that all the great captains have conformed to them while adapting them to the resources at their disposal. The practical means of action have undergone radical changes, as a result of incessant progress in all branches of human activity, but the same essential laws belong to all ages.

In his fine book "*Précis sur l'art de la guerre*," Jomini establishes minutely all the divisions of the arduous task which falls upon the General Staff; preparation of material, orders of concentration and of route, elaboration of the plan of campaign, determination of the enemy's position, drawing up instructions for the march and rendezvous, direction of reconnaissances, centralization of information of all sorts relative to the enemy's movements, etc., all this together is one of the most overwhelming duties which men can be called upon to do.

And who then, in presence of this program, still so vaguely sketched, could still maintain that its consideration can be postponed till the moment of execution? The part played by chance

is, in the very nature of things, already too great in the course of war for the attempt to restrict it not to be made. And they would truly be criminal in their blind ignorance who would persist in seeing the only remedy for all these difficulties in the convenient formula, *"trust to luck."*

It was quite thus that Jomini thought when he wrote, as the conclusion of his book, the following lines: *"If some prejudiced military men, after having read this book and studied attentively the detailed recital of some of the campaigns of great masters, still persist in maintaining that there exists no principle, no practical rule of war, we must be satisfied to pity them and to reply with Frederick the Great's well known saying,* 'A MULE WHICH HAD MADE TWENTY CAMPAIGNS UNDER PRINCE EUGENE WOULD BE NO BETTER TACTICIAN FOR THAT.' *Correct theories, founded upon true principles and justified by facts, are, in our opinion, when taken in conjunction with the lessons of history, the veritable school of generals. If these means do not make a great man, since great men are always self-made when circumstances favor them, they will at least form generals skilful enough to be perfectly fitted for the second rank under the orders of great generals."*

CLAUSEWITZ.

General Clausewitz in his turn shows us the immense part played in war by moral forces under all their aspects, passions, hates, fear. The most recent war has already given us most convincing proofs of the legitimacy of this conception.

For him, the immediate object of war is to strike down the adversary, and this object exacts the use of the maximum forces with a view to the greatest effort. The sole efficient means of war is battle; that is the essential thing, what I have already several times called the *principal objective.* *"Battle,"* says he, *"constitutes the whole action of war. In battle the destruction of the opposing forces is the means of attaining the object, even though the battle does not actually take place and the threat of it suffices to bring about a settlement; for in that case the enemy manifestly retires only on the supposition that, if he accepted the struggle, he would inevitably be destroyed. In war, then, the destruction of the armed force of the adversary is the corner stone of all combinations . . . . In speaking of the armed force of the adversary,*

we ought expressly to observe that nothing obliges us to limit this idea to physical force; but rather that everything makes it obligatory upon us to include moral force also, for the reason that these two forces are constantly mingled even in the smallest details of the act of war, and consequently are inseparable."

To form a fair judgment of Clausewitz's work, it should be read through, and it would certainly be a profitable task, but such a complete study would greatly exceed our limits; yet it alone enables his true military thought to be extracted from the mass of his literary labors. It is thus that, to every superficial reader, he seems to accord all his preferences to the defensive, which he regards as a superior method in so far as it is applied to the conservation of one's possessions, territories, forces, etc. A more complete understanding of his ideas leaves no room for doubt, on the other hand, as to the exceptional value that he accords to the offensive. Let this be judged from the following extracts:

"Outside of the destruction itself of the armed forces of the adversary, the different objects that it can be proposed to attain in war are positive objects, and, consequently, the offensive alone is capable of pursuing them." It is not less necessary to understand what Clausewitz means by the defensive. *"Passivity being absolutely contrary to the nature of war, this definition* (resistance) *can only be applied to the defence when the latter is regarded from a quite general point of view . . . . Resistance then can only be relative, and the defence, frequently changing its general form, ought to pass, in the course of the action, first from parry to parry and thrust, and then, as the latter gives opportunity, to* ATTACK. *One is on the defensive in a fight when one awaits firmly planted the shock of the enemy upon the point where one has taken his stand; in a battle, when one waits for the hostile army to come to face the positions that one occupies and the fire of the troops that one commands; finally, in a campaign, when one awaits the invasion of the theater of war of which one has made choice. Thus far the defence is in nowise in contradiction with the nature of war, for one can find his advantage in awaiting the enemy on a field, in positions or in a theater of operations the resources of which one knows and which one has studied and prepared in advance. But when resistance properly so-called has done its work, and because, to retain his part in directing the conduct of the war, the defender must necessarily return to the*

attacker the blows received from him, there immediately results an offensive action on the part of the defence itself."

"The defensive action therefore comports with offensive acts in each of its degrees, whether it is a question of fights, of battles or of campaigns. In a defensive battle, for example, one's isolated divisions can be employed offensively. This form of warfare, therefore, need not be looked upon as a shield, but rather as a weapon suitable for thrust as well as for parry."

And to still better define the expressions, already so clear, which precede, I will add this further quotation: *"A war in which one would be satisfied to use victory to repel the enemy, without ever attacking him in turn, would be as foolish as a battle the arrangements of which were made with the sole idea of an absolutely passive defence."*

Thus we find in these lines, on the one hand, the formal condemnation of that form of resigned waiting in which the defensive is most frequently conceived and which, in the history of all epochs, has never brought forth anything but defeats; and, on the other hand, the clear meaning, without any possible equivocation, which must be given to the expression defensive from the pen of this learned military writer. Thus understood, there is no contradiction with the conclusions which I have already myself developed; for the defensive, defined in this manner, is only a variety of the well conceived offensive. Better still, we can make an immediate application of it to the example of Tsushima. The "offensive," in the broadest sense of the word, permitted to the Japanese, under the threat of the speedy arrival of the Second Pacific Squadron, a great variety of solutions; it is this which explains why, from the day that fleet set out, the most fantastic projects were attributed to the Japanese Admiralty. The squadrons of Togo and Kamimura were made out by the imagination of news writers, on several occasions, within sight of Madagascar, then successively in the Strait of Malacca and that of Formosa; I omit the incident which happened in the Channel on the Dogger Bank. All these fleeting visions came from the very clear perception, forced upon the world by their previous operations, that the Japanese sailors had adopted the offensive as their line of conduct. To attack Rozhestvensky's battleships on the shoals of Hull during the night, with torpedo-boats, in another fashion than in the hallucinations of the Russian sailors; to surprise them off

Nossi-bé, at the entrance to the China Seas, or in the bay of Camraigne, or finally in the Formosan Straits, would have been just so many offensive acts. But to wait for them at the passage of the Korean Strait, in proximity to the Japanese bases of operations, in that very way having available the maximum of means of action, fighting ships, torpedo-boats, rapid communications, etc., was also the offensive in the sense given to it by Clausewitz, and the latter course, in the case considered, was incontestably superior to all the others. By going to meet his adversary, whether at Singapore or even only on the coasts of Annam, Togo would only have weakened himself.

This example, corresponding to the definition contained in the preceding quotations, throws a special light upon the value which should be exactly assigned to the idea of the offensive. Clausewitz adds further: "*The essential characteristics of offensive warfare are rapidity, decision and continuity of action,*" and also "*The greatest promptitude should be used in operations. Every loss of time, every useless detour brings about a waste of forces and is consequently a strategic error.*"

Thus once more is the high strategic value of speed proclaimed. "*In tactics as in strategy, superiority of numbers is, of all principles, the one which most generally gives victory.*" Thus does the Prussian general express himself upon an important point in the study of war, and he adds: "*The greatest possible number of troops should be brought into action at the decisive point. Such is the first principle in strategy.*"

And such is really the first act of war; but here it is indispensable to bring to notice that the greatness of this first effort depends entirely upon governmental action. This emphasizes the close tie which binds the initial strategy to politics. If, through the errors or the weakness of the latter, this so important opening effort is insufficient, if, in a word, absolute superiority of forces cannot be realized, it becomes necessary to endeavor to obtain, by surprise or by skill, relative superiority at the decisive point.

We have already seen the prime importance which Clausewitz attributed to battle; he defined it: "*Strategy's instrument for attaining the object of the war.*" An opinion as weighty as his adds new force to the conclusions I have already drawn from the summary study of the great wars of the past.

We borrow from him one last extract, which equally confirms what we already know: *"The battle at last gained and the victory won, it is necessary at once, without halt, without change, without reflection, without even taking breath, to hurl oneself in pursuit of the enemy, to attack him wherever he resists, to seize upon his capital, to destroy his armies of relief and to overturn all the supports of his power."*

Here we find again the idea that victory cannot be complete if it is not followed by the irremediable destruction of the enemy; without which it is but a half measure and does not satisfy the ends of the war.

It is not without a lively regret that I find myself compelled to leave the very captivating study of Clausewitz's works; but our space and time are so short that it is indispensable to limit myself. Yet I am unwilling to finish without making a brief allusion to the interesting chapter which treats of the theory of war, and more particularly of the knowledge demanded of the commander-in-chief: *"The general-in-chief,"* says he, *"does not acquire this varied knowledge from formulæ and from scientific processes; it requires on his part special aptitude, supported by the judicious observation of things and a judgment trained by the events of life."* He says again: *"Study and meditation can produce an Euler and a Newton, but experience of life and its great teachings are necessary to form calculators such as Condé and Frederick."*

These words, struck with the die of good judgment, are wholly worth remembering, above all in our times when there are revealed sad tendencies to misconceive the simplicity of the object and means of war, as well as its purely artistic and personal quality; to see in it I know not what false science of a dry and arbitrary character. For my part, I chose, without the shadow of a hesitation, Clausewitz's concept.

RUSTOW.

Another and more modern foreign military writer, Rustow, is not less affirmative.

Under the title *"Fundamental Laws of Strategy,"* he has collected a certain number of maxims which it is well to ponder.

"The fundamental laws of the art of commanding armies stand clearly forth from all the historical facts of war, and it will always be so as long as the nature of our means of war has not wholly

changed." After this statement of a principle already too well known to us not to be accepted without reserve, he expresses his maxims as follows:

In the first place, "*armies are the principal instrument and the principal objective of strategy, the true representatives of force in war. To develop as much as possible the activity of his own army and to restrain the activity of that of the enemy, to maintain his army and to destroy the enemy's, such are the dominating ideas that should direct the general-in-chief. Battle is the culminating act of war. It commands and determines all other operations of war.*"

Thus there is set forth anew, with perfect clearness, the idea of *forces* and the principal function devolved upon opposition to those forces, that is to say upon *battle*. Here now is how the elements of equilibrium of this antagonism of forces are to be established.

"*Victory is assured by superior forces; by the choice of the favorable moment, that is to say of the moment when one is strongest and the enemy weakest; by the choice of the suitable place, that is to say of the place where one is strongest and the enemy weakest. Success is further assured by a clear and precise conception of the result to be attained; by the intelligence which directs towards a single object all one's material forces and which advances straight towards it without deviating; finally by an energetic will which never loses sight of this object and never abandons it without necessity.*"

The very recent examples of the Russo-Japanese war demonstrate the excellence of these last principles; they are in some sort the illustration of them. Superiority of forces at the point where the Russians were weaker, choice of the most convenient place, clear and simple conception of the result to be attained, tenacity in the execution of the plan of action, all these conditions united assured success to the Japanese without requiring the presence of a man of genius.

This would suffice to prove, lacking other proofs, that there truly are, as Rustow, as well as Clausewitz, Jomini and so many others, has declared, a certain number of fundamental laws which cannot with impunity be ignored.

Superiority of force must first be sought in superiority of numbers. If the enemy is not outnumbered absolutely, nevertheless

he may be relatively, and it is necessary to seek to outnumber him at the point where the campaign is to be decided, that is in the theater of war, in the battle and on the field of battle, at the point where success is most easily or most certainly to be won. The possibility of securing a relative superiority results from the concentration of our own army and the division of that of the enemy. The union of our army is therefore the first rule of war; it may undergo modifications, but it never ceases to exist. If great armies cannot be kept united on a point or on a line, it is nevertheless desirable that the bulk of the army or the greatest possible part of it be united on the decisive point at the decisive moment."

These ideas confirm those which we have already derived from historical examples; they give special value to some of them as well as to the deductions which can properly be made from them.

Among these there is one of which the recollection is particularly vivid, and I recall it the more willingly because it is of such recent date. I allude to the fundamental error committed by the Russian government at the beginning of the last war, and which I have already had occasion to explain.

It now appears to us as in direct opposition to the principle laid down by Rustow. The theater of this war was certainly a vast one, one of the vastest in military history, for it embraced at the same time the seas of China and Japan, Korea and wide spreading Manchuria, without counting the Siberian steppes, Russia and Japan. But the theoretical numerical superiority of the Russians could have no value unless it was realized at the *point* of the immense theater where battle was to be delivered. As we know, neither on land nor at sea, could this result ever be achieved by the Russian General Staff, and that beyond anything else explains the persistent defeat of the Russian armies.

On the sea the lesson is the same. To satisfy the principle laid down by Rustow and his predecessors, it would have been necessary to concentrate in Far Eastern waters and at Vladivostok, that is to say on the probable battle ground, naval forces superior to those of the Japanese, and it was useless and could only be useless to send there *successively* fleets which, by their union, would have been of sufficient numbers to assure this superiority. There is no doubt that the junction *before the war* of the Port Arthur, Vladivostok and Rozhestvensky squadrons, in Japanese waters, would have given an incontestable superiority to the Russian naval

forces. Their separation, on the contrary, was to bring about their defeat in detail. This practical lesson throws a vivid light upon the strategical principle enunciated by Rustow, a principle already set forth in our previous conclusions, and which the Japanese navy applied from the beginning to the end of the late war with a remarkable understanding of its requirements.

Bearing on the second proposition, which relates to tactics, and which prescribes seeking superiority at the decisive point in battle, there are many experimental facts. Nelson satisfied this principle when at Trafalgar he smashed the center of the French-Spanish fleet by throwing upon it the whole weight of his own and Collingwood's squadrons. Tegethoff also was inspired by it at Lissa when he threw the mass of his forces upon the leading division of the Italian squadron. We have seen Ito also, in the battle of the Yalu, make the weaker right wing of the Chinese give way; and finally Togo, at Tsushima, turn the head of the Russian squadron.

In each of these cases, the victorious chief knew how to find the weak point, *the flaw,* in the hostile forces, and by concentrating the whole effort of his own forces on that decisive point to assure victory.

"With equal forces, an army will be so much the more formidable as there is harmony between unity of command and independence of parts, in such a way that these fractions have as much independent life as is possible without weakening the power of the commander-in-chief. The best method of arriving at this result is a proper subdivision of the army so that these fractions are neither too numerous, nor too strong, nor too weak . . . ."

Here again we have only the embarrassment of choice in finding famous applications of this maxim. Nelson, dividing his squadron and entrusting half of it to Collingwood, certainly had in view giving to the constituent elements of his fleet the greatest possible life. The example of Tsushima is still more striking, for on the one hand freed from the absorbing influence of a great genius like Nelson, who forcibly seizes upon and monopolizes our attention, on the other hand it applies to occurrences contemporary with ourselves, and employs instruments such as we use ourselves. The fighting force of the Japanese was composed, I remind you, of four battleships and eight armored cruisers, in reality twelve units which from the beginning to the end of the battle played identically the same rôle and which, consequently,

we have every right to comprise in the general category of fighting ships.

But it is easy to imagine the great variety of combinations by which this line of battle of twelve ships could be grouped in different ways. Between the two extremes, that is the long column of twelve ships and a series of independent divisions each of one or two units, there was evidently room for others giving to the totality more flexibility, activity and life than the former and less scattering of command than the latter. And finally, among them, one could be found uniting the two requirements with the maximum harmony. This was the one adopted by Togo, who, in dividing his fleet into two squadrons of six ships, each under the command of a chief, obtained under his sole direction all the advantages of a well manœuvering single column with more precision and vigor in the execution of the movements. He realized "*harmony between unity of command and independence of parts.*"

Rozhestvensky, on the contrary, with his crowding and unmanageable squadron, did not possess this harmony. And this contrast very well brings to view the interest which the idea of a "naval army" offers.

Thus we come anew upon the intimate bond which, in the field of principles, closely connects all the manifestations of the military art; there is really only one military art, since we have been able to make such a direct application to naval questions of maxims suggested to an author by matters exclusively concerning armies.

"*He who has a positive object in view can with the greater facility bring superior forces to bear upon the decisive point. He who waits, on the contrary, for the enemy to take the initiative, makes this problem the more difficult for himself. In fact, beside the principal and positive object that we chose, all others are secondary, and the forces which are devoted to them will be in the same proportion. But if we allow the adversary to chose, then several contingencies will seem to us to have the same value, and we will divide our forces equally to oppose these equally important contingencies. This it is which above all makes the offensive superior to the defensive.*"

These lines apply perfectly, although they were not so intended, to the case of Cornwallis, who, distracted between the necessity of blockading Ganteaume in Brest and the desire to re-enforce

Calder to allow him to paralyze Villeneuve in Ferrol, committed the grave fault, *the noteworthy folly* as Napoleon called it, of dividing his squadron. This fault might have cost him dear, with more resolute adversaries than the French admirals of that period were. The English admiral lost sight of the fact that by pursuing several objects at the same time he weakened himself everywhere; and that the primary object ought to be to prevent the escape of Ganteaume, the only contingency which would give to the French fleet superiority, even momentarily. Again, and perhaps with greater amplitude, we can make clear the application of this principle to the carrying on of the late war by the Russians. As a whole, as well as in detail, the Russian government made a passionate effort to accomplish the impossible task of repulsing all attacks at once; in the initial conception, not understanding the preponderant importance of naval operations, it wished to repel on the one hand the Japanese attack on land and to resist on the other hand their attack on the sea. Reason itself, on the contrary, as I have explained at length, would have imposed the exertion of the greatest effort on the sea. In details, the scattering of the naval forces at Port Arthur and at Vladivostok, and the isolated action of Rozhestvensky's squadron, all at the choice of the adversary, could only produce deplorable results.

As far as the principle of the superiority of the offensive is concerned, we see that this is affirmed no less clearly by Rustow than by the preceding writers; and he still better expresses his idea when he says: "*For the defensive to be as strong as possible, all the preparations must be directed by an offensive idea.*" Is not this the very thought already expressed by Clausewitz; and in view of the remarkable agreement between the propositions advanced by the most noted military writers, is it possible to believe this accord to be the result of chance? For my part I do not believe it, and I gain here a new conviction of the sure existence of certain fundamental laws of war, which we have already derived from the facts of experience, and to which the concordant testimony of *authors* adds a great value.

"*Victory is completed by pursuit. After his defeat the enemy needs rest to reassemble and repair his forces. This rest is forbidden him if he is forced to fight or to march rapidly in order to avoid fighting, perhaps under the most disadvantageous conditions. Thence follows the rule that the conqueror should pursue*

the conquered without delay, with the greatest possible speed and energy."

The naval battle of August 10 will not be noteworthy in history, because the Japanese did not amplify their success by an implacable pursuit of the retreating Russian ships; that of Tsushima will be remembered as one of the greatest disasters, if not the very greatest, which has ever occurred on the sea, because pursuit, this time persevering, finished what the battle strictly so-called began so well on the field of action.

"In any operation it should never be forgotten that the shortest road to reach the enemy has a marked advantage over the longest." This is the affirmation of the value of speed.

"The plan and preparation of an enterprise, whatever it may be, are never the act itself; and it is to the act alone that are due success and the diminution of the enemy's success. The plan of every enterprise ought to be made in advance. This is an indispensable condition of arriving at a predetermined end; but, beyond this end to be attained, a plan ought to take account of the nature of the means and of the existing circumstances. The first requisite of a plan of war is the greatest simplicity; for a simple plan is easier to conceive and to execute than a complicated plan. The second requisite of a good plan of operations is to limit the number and scope of those operations, to lay them down according to the known data, with room for the action of unknown quantities, and allowing sufficient freedom to the direction of the operations to enable the plan to be modified in the course of its execution, if circumstances require it."

In spite of their great interest, I must here cease to quote, since I am bound to limit myself. It would, however, be difficult to assemble, in a style more simple and at the same time more precise, as great a number of essential truths as are contained in the preceding lines. Formal condemnation of the method of chance and improvidence; affirmation of the necessity of knowing in advance what it is desired to do, by having a fixed plan of action limited by the means at one's disposal; the elasticity indispensable for taking account of fortuitous occurrences; prohibition of paralyzing the initiative of the commander-in-chief, etc.; all is to be found there. And what above all else ought to be remembered is the very formal declaration of the simplicity which should govern in

the preparation of operations. Everything is simple in war—plan, conduct and means.

This merit of simplicity appears to Rustow to be of the first order, for he says further:

"*Simplicity and independence of plan* (independence relative to the plans attributed to the enemy) *are principles of the military art.*"

And it is always in this same order of ideas that, speaking in a general way of the qualities of generals, and in particular of Mack, the Austrian general, "*well informed, but who only knew how to draw clear and neat figures upon which he spent much labor, and who made of the general a draftsman,*" he concludes: "*This love of geometric figures is the surest sign of lack of aptitude for chief command. The general ought to reckon with forces; the forces are represented by lines and directions, but they are not those lines themselves.*"

I shall refrain from weakening by any comment the scope of this very sane comprehension of the affairs of war. I limit myself to expressing the wish: May we make this doctrine our own!

VON DER GOLTZ.

Another contemporary expert, Von der Goltz, justly esteemed, estimates in these terms Napoleon's rôle: "*Our actual point of view depends in great part upon his principles. He recalled to military men a thing which Frederick had already taught them, but which they had forgotten, namely that it is above all important to destroy the hostile forces; that battle is what decides war.*"

In a remarkable chapter on "Conditions of success in war," this same writer states a certain number of principles, among the most important, which it is well to pause to consider.

"*The first of the conditions of success in war is* POLICY." This proposition is certainly not one unknown to us. We have so many times repeated, under the most various forms, that military action is inseparable from politics, that it is almost speaking a truism to say it again, so, in place of a formal argument, I prefer to call attention to some striking and quite recent examples of this close dependency.

Spain lost Cuba through the blindest and most improvident of policies; blind, because, beneath the rebellious outburst of the islanders, the Spanish government failed to devine the hidden

action of the United States; improvident, because, disdainful of the storm which each day grew blacker, Spain was unwilling to make any effort to prepare for war and to sell dearly to that nation the most beautiful pearl of her colonial crown.

How much more foolish still perhaps was the Russian policy in the Far East. To undertake economic expansion, to stretch like a long arm an iron way towards countries already coveted by neighbors as powerful as ambitious, to begin as at Dalny a great commercial enterprise without developing along with it the organism of forces alone capable of imposing respect and guaranteeing the free flowering of that work, was to labor for the foreigner and to follow a detestable policy. Clausewitz had already very well explained, moreover, the intimate relationship between war and politics.

This latter alone designates the end which is to be sought and the general means of attaining it, and presides, especially in time of peace, at their preparation. This justifies Von der Goltz's phrase: "*Without a good policy, it is not probable that a war will turn out fortunate.*"

Moral force has no less importance in his eyes, and he even accentuates the opinions of his predecessors in this excellent maxim which I have already mentioned: "*It is essential that the commander-in-chief, as well as the troops, have the* FIRM WILL TO CONQUER." The memories of recent wars are too present to our minds for us not to understand the deep truth expressed by the preceding lines. The lamentations of unhappy Cervera, an echo of those further off ones of unfortunate Villeneuve, the cowardice of Ouktomsky, the moral weaknesses of Enquist and Nebogatoff, without mentioning the deplorable state of mind of their men, point out all these leaders for defeat. How could they hope for victory when in advance they despaired of it.

We are now going to find, from the pen of the German author, the affirmation of certain fundamental principles already known: "*The first object, and the principal one, towards which the movements of armies are directed is the hostile army.*" He thus assigns the great first rôle to battle, of all the operations of war. "*He who has on his side superiority of numbers has a great chance to triumph over the adversary.*" But after formulating this maxim, he is careful, being a man who has cultivated his knowledge by the

constant study of great wars, not to forget to specify what is to be understood by the expression "superiority of numbers."

He explains first that it cannot be a question of comparing a numerous but poor army with a small but good one; numerical superiority as between two armies of equal quality is what is meant. This moreover is in accord with common sense, and with arithmetical reasoning, which only admits into its calculations units of the same kind; and it would even seem idle to repeat these commonplace truths if in our time still they were not contested à propos of naval problems.

The time has but lately gone by when a Minister of Marine, to justify the construction of armored cruisers of reduced size, relied upon this more than doubtful aphorism, that two weak men are worth as much as one strong man. Beyond its lack of precision, for wanting a measure it is difficult to understand what is exactly meant by weakness or by strength, both essentially relative, this statement contains another capital error; it is wholly sentimental, and we ought to reject everything which is not based upon the experience of war. It is to this aphorism, moreover, that we owe a type of ship very happily limited to three examples, and against which there was very properly an almost unanimous opinion. So true is it still that the principles of the military art apply admirably to our apparently more special field. We are therefore in agreement with Von der Goltz when he limits the application of the idea of superiority of forces to forces of equal *unit* value.

After having conveyed this needful precision in the definition, the German military writer adds: "*The first and main principle of modern tactics is* THE GREATEST POSSIBLE NUMBER OF MEN MUST BE BROUGHT TO THE PLACE WHERE THE DECISIVE BLOW IS TO BE STRUCK." And we find once again as always the true meaning of superiority of forces in war.

We are going to see again likewise, from Von der Goltz's pen, many other ideas which are familiar to us; those which follow are specially interesting for us.

"*To make the fullest use of all the means at one's disposal is the principle of war at the present time.*" These words bring out clearly the plurality of means of action in war which we have already had many occasions to remark. Accordingly the same author lays stress upon the importance of wealth and of the factor *money* among the conditions of success, and he adds: "*Whoever*

can sustain a war for a long time possesses an important guarantee of final success." The undoubted value of this principle can be brought out by historical examples. In the first place, it may be recalled that though England, in her implacable struggle against Napoleon, finally succeeded in conquering him, the colossal military forces of the Emperor, directed by the greatest genius in war that humanity has known, were definitely broken in 1815 at least as much by the financial power as by the material forces of Great Britain.

Again, in the late war, at the time of the signing of the treaty of Portsmouth, a cloud was beginning to be seen forming on the political horizon, disquieting to the Japanese, whose financial embarrassments, known to every one, threatened to compromise their magnificent military exploits. Nothing could show better than this very recent example the power of money. "*The possession of money, it is true, is not alone to be taken into account, but also the greater or less facility for making use of it. States which, in case of war, keep open their sea communications have ways of using their credit quite other than have those whose ports will be immediately blockaded. The former will moreover be able to have recourse to foreign industries for the armament and equipment of new armies. Without this last resource, the government of the National Defence would never have been able, in the late war, to constitute the formidable armies which astonished the whole world. If, in 1814, Napoleon had had this resource, affairs would have turned out differently. The Southerners, in the American War of Secession, succumbed in spite of their military superiority, because their communications with the sea had been cut. The control of the sea therefore contributes indirectly to strengthen a State, even if its fleets are not able to give direct aid to its army.*"

It is singularly suggestive to see a writer deeply imbued with military doctrines, the undoubted exponent of the controlling idea of the German General Staff, affirm so clearly the very important rôle assigned to the navy, when this is so often misunderstood, not to say denied, in France, even by seamen; it should be remembered that Port Arthur would never have been taken if the sea had been free.

"*Though wealth greatly augments strength, it only becomes fruitful if,* AT THE PROPER TIME, *every sacrifice is made.*" At the proper time! A world is contained in those three words; all possi-

ble sacrifices tardily consented to could not make up for initial negligences. What would the few millions necessary to prepare a navy strong materially and morally weigh in the balance of Spain's accounts, in comparison with the economic breakdown which came to that nation from the loss of Cuba? Is it possible to compare the eight or nine hundred millions which would have been the cost to Russia of the eighteen battleships necessary to insure the success of her policy in the Far East with the thousands of millions that an unfortunate war has made her lose, without counting the loss of her commercial influence in Chinese waters?

In a more familiar field, an insurance premium costs very little in comparison with the accidents, fire, death or injury—against which it is intended to protect private interests. What then is preparation for war if not the premium of insurance against the risks of war, the only efficient one, I must say, that has thus far been found, the only one also, I firmly believe, that ever can be found. It is truly so that the sense of the expression "at the proper time" must be understood, and it cannot be too often repeated that sacrifices agreed to in order to have a powerful army and navy, military forces in a word capable of imposing respect upon all, are a sure economy. The painful memory of the loss of two provinces and the ransom of five milliards is enough to convince us who are Frenchmen of the great importance of preparation for war. May that hard lesson serve us and teach us also to be prepared as regards naval war!

I have already had occasion, in the preceding chapter, to cite an opinion of the author we are now considering on the subject of the offensive.

After having considered the comparative advantages of the defensive and offensive, as well as their disadvantages, with arguments that we already know of, he finally pronounces very categorically for the latter, of which he says: "*The offensive requires a greater activity than the defensive; that alone is a great gain, for of two adversaries otherwise equal, the one who is the most active will conquer.*" .

The question here is definitely as to the influence of the factor "speed."

That which gives exceptional value to the military writers whom we have just reviewed, and which has led to this very extensive consideration of their opinions, is that those opinions are

the result of profound studies of the experiences of great wars, and, as far as the two last are concerned, particularly of that of 1870, which will long remain in history as the model of the triumph of methodical preparation for war.

Among authors who have more especially devoted themselves to the study of naval warfare, the choice is more restricted; not that there is not an abundance of naval writings, but quality is rather rare; at least that which we ought to seek for, that is sincerity of convictions based *solely* upon the experimental lessons of war. Before Tsushima, for a century there had been few or no examples of naval battles truly worthy of the name; perhaps this poverty of facts exclusively naval is the necessary explanation of the result that so many writers have ridden *their hobbies* instead of endeavoring to free themselves from prejudices and generalize great principles.

MAHAN.

Mahan won his very great and deserved fame by breaking away from the sentimental method, which opens the door to every sterile discussion and never puts an end to one of them.

It is to be understood that I cannot pretend to present in a few pages the complete work of the eminent American writer; all of it should be read and re-read, and here I must limit myself to an explanation of his theory. This appears in his first pages, when, after having recalled the respective advantages formerly attributed in battle to the windward and leeward positions, he remarks that henceforth it is *speed* which will permit taking the most favorable position. It is worth while in this connection to recall the precise terms by which he indicates what should be understood by superiority of speed: "*This does not mean only a squadron whose individual ships have superior speed, but also one which has the greatest uniformity of action through the homogeneousness of its units.*"

In this sentence two fundamental principles of tactics are laid down: the importance of speed, and the absolute necessity, so many times recognized, so often unaccomplished, of homogeneous forces.

These two principles call for some comments. In the quest of speed a chimerical object has only too often been pursued, one in all cases unprofitable, and which quite a large number of writers even of our time define thus: the possibility of accepting or refusing battle. We already know what is to be thought of this wholly

erroneous conception of war, which tends to reduce battle to the part of one solution, among many other very different ones, of the problem of war, while it really is the only solution. It is therefore indispensable to dissipate any possible misunderstanding upon this important point and to explain how the following sentence of Mahan must be interpreted: "*The power to assume the offensive or to refuse battle . . . .*"

Whoever is penetrated with the author's thought can have no doubt on this subject; what he wished to point out is that superior speed allows engaging in battle under the most favorable, chosen conditions, and remaining master of one's conduct. It is truly thus that it must be understood. The power of the guns, the characteristics of the individual ships, carry with them limiting firing distances within which the conditions of the contest are more favorable; the relative position of the sun is also nowadays of great importance. All these advantages which it is necessary to strive to secure in entering upon an engagement, speed alone can give. It was speed that enabled Togo to turn the head of the Russian column at Tsushima; it was speed also to which Ito owed his ability to outflank the Chinese right wing. Napoleon won his most splendid victories by his constant use of speed on the battle field. But this superiority is only real if all the units of the naval force can participate in it; it is therefore essential that all those units have the same speed. That is the proved truth, and a great number of leaders had already announced it in all countries before Mahan. The speed of a naval force is always equal to that of the slowest ship which forms a part of it. If then I insist upon this observation, it is because this eternal truth seems to have been so little understood in France that, even quite recently, the characteristics of a great ship, the *Ernest-Renan*, were modified, in the course of her construction, to give her an increase of speed. Such measures cannot be too energetically condemned, being a veritable squandering of money, seeing that this ship, necessarily forming part of a naval force of slower ships, will presumably not have the opportunity to make use of this excess of speed. The question is too serious for me not to insist upon it. It is too often forgotten that a war ship is of little worth by itself, but is above all an individual in a fleet which, by its assemblage, *alone* constitutes material *force*.

I have too often already affirmed the value of speed, especially from the strategical point of view, for my opinion on this subject

to be misinterpreted; but it must be well understood that in advocating one or another factor of naval strength, I have in view giving it to the *fleet* and not merely to an isolated ship, an absolutely fruitless result.

It is particularly interesting to seek Mahan's lesson in the critical study of the naval war of 1778. He first explains, with remarkable clearness, the respective situations and aspirations of England on one hand and of the allied powers, France and Spain, on the other, at the opening of that war. The legitimate desire of England to preserve her American possessions logically placed her in a defensive position. The allies, on the contrary, under the sentimental pretence of aiding an oppressed people to secure its independence, pursued well fixed aims of conquest or annexation. Both, besides cherishing the hope of weakening the English naval power and thus taking revenge for past defeats, aimed at territorial acquisitions; Spain wished to reconquer Gibraltar and Mahon, France had in view the West Indies. These various motives gave to the policy of the Bourbons an offensive character.

This interesting observation of the American author is extremely valuable for us, for it will enable us to define, with a precision leaving no room for confusion, what up to the present moment we have meant by the expression "*offensive*."

I have not wished to speak, in fact, of a political offensive, and to advocate for our country an aggressive attitude of adventures and conquests; when we speak of naval strategy and tactics, there can be no question of assuming the air of a mousquetaire, fist on hip and rolling eyes. For us the offensive is merely a method of making war, which has given its proofs, and which, on that account, appears to me wholly worthy of recommendation when it becomes necessary to make war, whatever the character of the causes which have brought on war, even should it be purely defensive. A people has the duty not to attack its neighbors, but it has no right not to know how to make war, if it is attacked.

And the observation is the more essential to make because, by a truly disconcerting contradiction, while the political objective of the allies in 1778 was so frankly offensive, the means employed by them in the conduct of operations preserved to the end the defensive character. The English, on the contrary, adopted most frequently offensive action. As may be seen, it was not useless to elucidate this important point.

As Mahan very justly observes, it would have been necessary,

in order to satisfy the objects of the war as conceived by the allies, to seek above all naval supremacy, particularly in the West Indies, in general over the whole theater of the war. Every conquest made without this primary condition could have evidently only a provisional and precarious character; it could only be considered definitive when the English war flag had disappeared from the seas. The American writer is very right then to say that "*the key of the situation in the West Indies was the fleet.*" The struggle against the English naval forces was truly therefore the *principal objective;* not only in the West Indies, but also in the Indian Ocean, the only point of the theater of war, as it happened, where the chief of the French naval forces perceived this fact and acted accordingly. The taking of Trincomalee was not in derogation of this principle; it was made necessary by the urgent need, with a view to facilitating the offensive against the English squadrons, of giving to the French fleet a base of operations which it lacked, and of allowing it to shelter itself during the stormy season of the northeast monsoon. Suffren, with his inspired understanding of the affairs of war, well knew this and chose his point still better, *to windward* of his field of operations. He knew how, moreover, lacking complete command of the sea, skilfully to profit by the absence of his adversary; this exception is a wonderful confirmation of the rule.

The errors committed by England in the course of this war nevertheless gave the allies fine opportunities. The total naval forces being nearly equal on the two sides *as far as material was concerned*, that is in number of ships, and that to England's disadvantage, on account of the number of points where her interests were threatened, that power committed the error of dividing her forces to make head at too many points, and also the error of attempting, by continual convoys of troops, to retain her American colony under her dominion.

With skilful leadership, the allies had therefore the best chance; but for that it would have been necessary to break with established traditions and routines; I ought to say, more exactly, to do what the government as well as the leaders of the two countries were incapable of.

On Spain's side, her obstinate determination to retain her ships near Gibraltar, in the chimerical hope of making that rock fall into her hands, and also the independent pursuit of her personal aims in the Floridas, for example, had an evil influence on the

necessary military work. In the councils of that nation, no authoritative voice was raised to make it understood that the rock of Gibraltar would much more surely become again national territory if the English naval forces which were its sole bond of union with Great Britain were destroyed, and that, by this same preliminary result, the world-wide ambitions of the nation would be satisfied with more certainty.

On the side of France, though there was greater loyalty in the execution of the alliance, there was no greater sense of the true plan of the war. To speak truly, the directing authorities were wholly under the influence of that ill-omened and ancient tradition which placed first among the objectives of war the pursuit of enterprises of annexation or of conquest, or the execution of a mission, and relegated battle to a secondary place.

Thus were found united more conditions of weakness than needful to explain how, possessing in reality superiority of numbers at several points of the theater of war, the allies never had the idea of profiting thereby to beat the English naval forces; thus to conquer command of the sea and to assure in that way the success of all their claims.

Offensive in its proper character, their war was defensive in its execution, and for that very reason fruitless.

THE ENGLISH TRADITION.

Instructed by her own errors in the course of this war of American Independence, England was resolutely to take the offensive twenty years later and to compose thus, from 1798 to 1805, the most glorious pages of her naval history. The examples of Nelson's method, cited many times in Mahan's fine work, although the campaigns of the great English admiral were subsequent to the period which is there specially considered, show with sufficient eloquence, without more direct quotations, the doctrine of the American publicist. It is wholly contained in one simple formula: battle with the enemy afloat.

It cannot be doubted that the actual successors of the English admirals of 1805, and in a more general way the English Admiralty, have piously conserved the tradition to which their country incontestably owes its extraordinary power in the world. I wish no better proof than the following words, taken from an essay of 1898 by Commander Ballard, crowned by the Royal United Service Institution, on the protection of English commerce

in time of war: *"Those who have thought on the matter at all will probably agree that the necessary basis of any protection whatever must be a sufficient superiority in battleships on our part to destroy, capture or blockade in their own ports the main squadrons of the enemy as in former wars, which in itself would constitute the chief source of safety to our shipping, and without which it would be idle to talk of commerce existing at all, ... unless* (the destruction or blockade of the enemy's squadrons be) *successfully effected, it would be useless to attempt anything else."*

"It obviously follows, however, that the more thoroughly their duty of watching the enemy is performed, the greater this protection will be; indeed, the opinion is apparently held in some quarters that this is all that is required."

There is the doctrine faithfully transmitted for a century, and it is the true one. No example could show better than this the striking truth. When interests of any sort are threatened, one can choose, to protect them, between two systems, and only two; either to defend them directly by covering them with a force sufficient to impose respect, or better still to destroy the menace itself. At the risk of appearing to make a comparison a little homely, I will say that if the conditions of our private life obliged us to return home late at night, exposed to the attacks of prowlers, two procedures of self defence would likewise be available for us. We might wear constantly a coat of mail; but it would be equally permissible to supply ourselves with a good revolver, a stout cudgel, or even, in this time of admiration for everything Japanese, to take lessons in Jiu-jitsu, to put the said robbers promptly out of condition to harm us. The second procedure, which is no other than the *defensive offensive*, is assuredly the better; who could say, moreover, that the coat of mail would not have a flaw? In the case of the protection of the English commerce, the immense network of which covers the whole surface of the seas, what protecting bands of ships of war could be great enough not to have flaws?

In Commander Ballard's view, initial protection by the previous conquest of command of the sea is a settled question. So his essay considers only the protection of commerce against the isolated and momentary action of a few cruisers that have accidentally succeeded in escaping the watchfulness of the blockading forces.

This is the same fundamental principle that Lord Balfour adopted, with strong conviction, scarcely a few months ago, when, in the English Parliament, replying to a question concerning the

defence of the British coast, he affirmed that so long as the English squadrons held the uncontested supremacy of the seas there was no need at all to seek a better arm of defence. Oh! I know very well that those who judge superficially, or those who do not wish to see, will not fail to challenge this so English a doctrine on the pretext that the English navy, having strength and numbers, has an evident interest in its adoption. This doctrine is in no way the monopoly of one nation; it is impersonal, and for that reason it compels acceptance. We have seen it thoroughly expounded by military writers, outside of any naval consideration, and finally if the English have adopted it, that is because by it they have always remained victors.

Furthermore, the German generals or writers of the present day, Von der Goltz, Janson, Verdy du Vernois, etc., have adopted this same doctrine and demand, with the Emperor, the construction of a powerful offensive navy.

This conviction imposes itself on our minds with such force that if I revert to the conclusions of these two last chapters I am almost afraid again to have heaped up commonplaces, so evident do these truths appear. In the preceding chapter I allowed the facts of history themselves to speak; in this one I have gathered together the words of the most justly authoritative writers; it cannot then be a chance result that the conclusions are so concordant.

Another thought is worthy of our consideration; if so many illustrious warriors, if so many famous military writers, for a century past and still in our time, have felt obliged to continue to express certain ideas under forms scarcely different one from the other, it cannot be for the vain satisfaction of reproducing them. If they have not feared to keep on repeating them, it is because they had the profound conviction that these truths demand more than a passing and as it were complaisant acceptance, and that they ought definitely to establish themselves in minds with the irrisistible force of dogmas.

This result attained permits, and this alone permits, in examining any military situation, perceiving the errors committed at the same time as the appropriate remedies.

THE FRENCH SYSTEM.

I have believed it a duty to insist so much upon principles apparently so simple, because at this very moment there appears to be a persistent tendency to return to the ill-omened ideas of Ramatuelle, to which it is attempted to give a new birth.

The almost forgotten personality of this naval writer is of little importance; it is his ideas which I regard as deplorable and which I combat with the fiercest energy; for they would lead us straight to defeat as they led our fathers there.

In expressing them, moreover, he has only reflected the state of mind of the French sailors of the 18th century, I might almost say of every period, which makes it all the more necessary to destroy forever those ancient fallacies.

Mahan has himself called attention to this strange doctrine, and quoted the following words of Ramatuelle: "*The French navy has always preferred the glory of assuring or preserving a conquest to that more brilliant perhaps, but actually less real, of capturing some ships, and therein has approached more nearly what should be regarded as the true end of war. What, in fact, could the loss of a few ships matter to the English? The essential point is to attack them in their possessions, the immediate source of their commercial wealth and their naval power.*"

It is well known what results we got, a hundred years ago, from such a conception of war. By conquering Egypt Bonaparte attacked England directly in her possessions, for he thereby threatened the route to India; he thought that he could do so without regard to the active naval forces of England. This initial error, in conjunction with Bruey's lethargy, brought about Aboukir. The same forgetfulness of this fundamental truth, that before all else the fleet constitutes the effective force, led Villeneuve to Cadiz and Trafalgar.

These ideas of Ramatuelle are moreover directly contradictory of the sentence with which he begins the chapter of his work which is entitled: *On Battle.* "*The battles by which the great quarrels of nations and sovereigns* ARE ENDED *are the direct and final object of all military tactics.*"

There is nothing to be objected to in this definition, which emphasizes the preponderant rôle of battle in the problem of war. It indicates, in fact, that by it, and by it alone, are conflicts settled. And it is quite surprising to find again, from this pen, the very logical idea that the breaking of the equilibrium of the opposing forces alone is capable of putting an end to the struggle; for after all, as long as that equilibrium lasts, that is to say until the meeting of the forces has occurred, how could it be hoped "to assure or preserve a conquest," as is counseled in the preceding quota-

tion? It is therefore by a curious irony of fate that we borrow from Ramatuelle himself the logical conclusion of this chapter.

The aim as well as the principal objective of war, the surest way of fulfilling its objects, is and always will be battle, and by its means the destruction of the enemy afloat.

NECESSITY OF AN INITIAL DOCTRINE.

Before ending this chapter, it seems to me quite indispensable to go back to the motives which led me to choose the method of exposition of naval strategy and tactics which I am following, in order to point out its precise scope and to dissipate all causes of misunderstanding which might arise on that subject. I made my choice deliberately and after careful thought. I have already pointed out, I recall, that I could have decided upon another and quite different method, which consists of taking a particular war or battle, of investigating it to the smallest details, of bringing out the errors made as well as the operations which were correct, and finally showing the acts which would have modified the results, in order to derive from all this an important military lesson. This method is the one followed in most military works in which a campaign is thoroughly studied. It is also that of the Military Academy of Berlin. These two facts can hardly fail to raise some doubts, and that is why I think that I ought to explain my position as clearly as possible.

Such a method, assuredly the most perfect for teaching the military art, requires, to be fruitful, one absolutely necessary preliminary condition; that is that all to whom it is applied possess a certain minimum store of ideas in common regarding the most essential truths. It is this that General Bonnal wishes to express when he says: "*Initiative, that quality of character which nothing can replace, can act usefully only to the extent that it is directed by community of thought; in other words by a doctrine common to all the members of the army.*" In his *The Nation Armed,* Von der Goltz also writes: "*The principles of Napoleon form even to this day the basis of our doctrine.*"

And at once the question arises whether we have attained in the navy to this community of thought, to this general orientation of minds towards a single doctrine, without which military studies lack a base.

To reply to this question, it is sufficient to propose for general consideration a concrete problem, as for example that of the most

efficient means to be used to sustain a war with England, with the naval resources, truly very inferior to hers, now at our disposal. The most widely different solutions, and often even the most unexpected, will be found proposed. I have myself brought together numerous examples of them, and yet, if we truly possessed a doctrine, there ought not to be any divergence of views as to the principles themselves of this war. I showed in the preceding chapter that regarding another general principle, that of the objective which Rozhestvensky ought to have fixed upon, there was also no agreement. If then, upon propositions so fundamental, there is no community of thought, what conclusion can be drawn except that naval minds are not yet ripe for a wholly rational instruction in the military art? We need not be surprised at this; the Naval War College is of too recent creation to have been able in so few years to impose upon all in our corps, I will even say upon all the officers who have had the advantage of its instruction, that unity of views and conceptions which, in all the problems of war, dictates to all, by its irresistible obsession, the same solutions.

It is not just then to compare the methods of teaching adopted *at this time* in the two war colleges of the army and of the navy. To make a few comparisons, it would be necessary to go back to what the Army War College was only a few years after 1870.

General Bonnal informs us regarding this in the following words which date from 1892, twenty-two years after the "terrible year": *"The ignorance which reigned in our army of 1870, in the matter of practical knowledge of the affairs of war, is known to every one."*

"The lesson which events have given to us has not been lost; for never, at any epoch of our history, has an activity been seen comparable to that which manifested itself after the late war.

"Confused in the beginning, ideas have little by little formed themselves into groups about a few great principles of experience that have formed the basis of a doctrine aiming at discipline of the mind, to-day in full period of development, in which the War College has taken a large part.

"A doctrine of war does not impose itself; it is born of the unanimous concurrence of understandings under the empire of convictions PROGRESSIVELY *acquired."*

The idea could not be better expressed, especially to show the needfulness of time for accomplishing a lasting work in any military institution.

That of the Military Academy of Berlin, which has conducted the German army to the wonderful results we know of, did not escape from this natural rule. In 1806, Scharnhorst, who was the real promoter of the new methods, adopted the study of Napoleon's campaigns as the course of instruction of the academy. But the true masters of the German General Staff were beyond contradiction Clausewitz and Willisen: it is they who brought forth, from the constant study of the philosophy of the *facts* of the Napoleonic wars, the whole body of doctrines with which the German army is so thoroughly indoctrinated, and by which Marshall v. Moltke profited so wonderfully.

It is important to note that the patient labor of adaptation has required no less than half a century; and this observation enables us to estimate the part necessarily played by time in the long drawn-out work of preparation for war, especially if it is needful to discipline ideas, as is urgently the case in our navy.

If Von Moltke was able to perfect the method which he had inherited from his predecessors, first by twofold exercises on the map and in the field, and then by still more profound critical examinations of the campaigns of the "great master," it is because, more favored than his predecessors, he knew the orders and intentions as well as the principal instructions of Napoleon. In the comparison of the great captain's directing thought and its execution, he found the elements of a marvelous teaching.

The mode of procedure is not otherwise to-day in the French army, and there will surely come a time, not far off, when we shall be inspired by a similar method in the navy. But for the moment a more pressing need, let it not be forgotten, claims our whole attention; let us learn to think in the same way about fundamental truths, and when this result is attained, the French navy also will be in possession of a doctrine.

Yet it must be observed in closing that even to this day no harvest nearly so abundant as those of the wars of the Consulate and the Empire is offered to us in the field of naval warfare. I can see, in modern times, only the Russo-Japanese war and the battle of Tsushima which are of sufficient scope to furnish a reasonable instruction. To utilize them fully it will be necessary to wait for a knowledge of a great number of details which remain very obscure and especially of what the motives of the commanders-in-chief were.

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THE PIONEER OF AMERICA'S PACIFIC EMPIRE: DAVID PORTER.

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The great, immediate, and entirely unforeseen result of its war with Spain was to make the United States a colonial power. Just before this war, it was never a matter of discussion or debate whether or not it would be advantageous for our country to extend its authority to lands beyond the seas.

The war with Spain was inevitable. Never would the people of Spain voluntarily have permitted their government to agree to Cuban independence. They had to be whipped into doing it. Americans almost to the last man believed that incredible cruelties were being inflicted on the island of Cuba; that, at last convinced of the impossibility of subduing Cuban patriots by arms, Spain had determined upon a policy of extermination by starvation. Reports, on the face authentic, were published that hundreds of thousands of Cubans, a majority of them women and children, had been starved to death in the reconcentrado camps; it was unbearable to Americans that such destruction of human beings should continue so close to their shores. The blowing up of the Maine precipitated the conflict, yet before this, war between Spain and the United States had for some time been inevitable. Each government occupied a position from which it could not recede, and war had to come.

In going into war the United States was influenced by no desire or expectation of extending its own authority or adding to its territory. Such contingencies may have been foreseen by a few far-sighted men, but they were not at all considered by the vast populace of America who were clamoring that the intolerable conditions in Cuba should cease. Americans, having no faith whatever in Spain, in her motives, in her promises, insisted that

Cubans must be entirely freed from Spanish rule, that Cuba must be independent. Here was a condition that could not have been made a subject of arbitration. America went to war to set Cuba free, and for no other purpose. The end of the war saw Cuba freed from Spain, but this was only a small part of the result to the United States. It really was but an incident.

The great result was that our country became a colonial power, controlling Cuba, and possessing Porto Rico in the West Indies, and Guam and the Philippines in the far east, and Hawaii in the mid-Pacific. A few other small islands, among them Wake and Midway, were also added.

The capture of Porto Rico was, of course, part of the campaign. It was untenable that this island should remain under the Spanish flag; this was determined by the President and his military advisers, not by congressional action. Without ever having given much thought to Porto Rico the American people accepted the capture and annexation of that island without demur.

While the war against Spain was in progress Hawaii voluntarily put itself under the stars and stripes. This was not incident to that war. It was a measure long determined upon by the governing element of that country. It had been tried once before, in 1893, when Queen Liliuokalani and her native government had been deposed, and the American minister had raised the American flag, only to see it hauled down and his action disowned by order from Washington. After this the Republic of Hawaii was established, but every one knew that this could be but temporary. The ruling element there was entirely American in sentiment, and most of them were of American birth or descent and clung to their American citizenship as underlying their Hawaiian denizenship. These but waited for an auspicious time again to throw themselves under American sovereignty.

Guam, of the Ladrone Islands, was taken by the *Charleston* in June, 1898, without resistance, and in fact, in its remote seclusion without knowledge that it was included in a war.

The island of Tutuila, of the Samoan group, in 1899, became a possession of the United States by treaty with Germany. Our flag has also been hoisted from time to time over various islets of the Pacific Ocean which, except Wake Island, used as a cable station, are unimportant.

The Philippine Islands became lawful prize of Dewey's guns

on May 1, 1898. They were captured from the Filipinos later. International courtesy accorded the title of possession of these islands to Spain, but after Dewey's arrival it was only American arms that made that title good. The truth is that immediately upon Dewey's arrival Filipinos started in on their own hook to capture the islands for themselves, and at the time Dewey hoisted the *Olympia's* flag over Manilla, on August 13, 1898, the Filipino revolutionists were everywhere else, except in two minor points, in possession.

Dewey could have taken Manila at any time after his victory. Also at any time after that, had Dewey sailed away, the Filipino revolutionists would have made complete their physical conquest of the islands from Spain. Although Spain surrendered her title of legal sovereignty to the United States, she did not have much else to give up. Except Manila, the revolutionists had made a complete conquest of the Philippine Islands. But international courtesy, or what might be better named international necessity, sanctioned the transfer of the entire archipelago. This can be defended, probably successfully, on the ground that the Filipinos had acquired no right to international recognition as belligerents. However, in considering the causes that actuated or compelled the United States to receive the title of these islands, their internal condition should be understood, as well as their relation to the great powers.

These causes were several, the most important were sentiment at home and international necessity abroad.

American patriotism was stirred by the glory of American arms, ten thousand miles from home. This was fed by pictures of the glowing richness of these far-off islands, of the vast trade soon to spring up in the Pacific, and of the ultimate great benefit possession of these islands would be to America. But outside of the United States, international necessity, or jealousy, or balance of power, however it be termed, regarded the fate of these islands with intense concern. The great European powers would have been content either to see the islands revert to Spain, or retained by the United States. In December, 1898, at the time of the treaty of peace with Spain, the United States could not with self-respect or honor have abandoned her former allies, the Filipinos, and restored them to Spain. The Philippine Islands could not be restored to Spain, and it was impossible to abandon

them to themselves. The only course open to the United States was to accept the moral duty which the war with Spain had thrown upon her. It must be agreed that the disposition of the Philippines put great responsibilities upon the United States toward other great powers. Retaining them for herself was the least difficult way out of a probable international complication over them.

These points have been touched upon for the purpose of fixing the attention on the fact that the United States did not intentionally become a colonial power. Nor did she become one as a result of policy, or belief in the desirability, or benefit, of such an eventuality.

To show how little the United States contemplated the possession of extralimital territory and how it needed an act of war to arouse us to our outlying needs, reference may be had to the Revised Statutes regulating the occupation of guano islands by American citizens. These Revised Statutes state that when a citizen of the United States discovers guano on an island, rock, or key, not within the limits of the United States, and not occupied by citizens of a foreign government, and takes peaceable possession and occupies it, this island, rock, or key may be considered as appertaining to the United States. And further, when the guano is all removed, the United States is not necessarily to retain possession of the island, rock, or key, which had been temporarily occupied by American citizens.

Under ordinary conditions it is quite conceivable that a treaty of peace with Spain would have restored to her the Philippine Islands. But our bringing Aguinaldo to Cavite from Hong Kong, and the subsequent victories of the Filipinos over Spaniards in every part of the archipelago put us in a position toward the natives from which there was no escape. Had Aguinaldo reached the islands without help from us, had he started on his remarkable career of conquest over Spaniards without our assistance, we might have been under no moral obligation to the Filipinos when the final disposition of the islands was determined. Had there been no native insurrection against Spanish authority the islands could have been restored to Spain by the treaty of peace. The fact that we brought Aguinaldo to Cavite in one of our government ships, and assisted him at the outset of his remarkable career, has proved to be of momentous concern to the

United States. That act obligated our country to take the Philippine Islands without reference to whether they were to be of strength or weakness, a support or a burden, a benefit or an expense.

The last few years have seen acts of grave import in the lands and islands of the Pacific. In the school-boy geographies of thirty years ago China and Japan were described as half-civilized countries. Since then great western nations have annexed islands and great territories, and have established spheres of influence. Japan has forged to the front as a world power. The world has been awakened to the future possibilities of China, with her vast riches in mineral deposits and her enormous population. The conviction of future tremendous trade in the far east has caused all occidental powers to secure footholds in these regions. With the Panama Canal, and naval bases in the Carribean Sea, with harbors on our Pacific coast, with Hawaii, Tutuila, and the Philippine Islands, it would seem that our country is bound to have her share of commercial enterprise in the Pacific, now that she has marked, if not protected, the highways of such commerce.

What we have done in the Pacific and what we intend to do has been a matter of constant discussion in the press, at public meetings, and by the home fireside for nearly ten years throughout the length and breadth of our land. And in it all, is it not supremely astonishing that the glorious prematurity of the forerunner of all American annexationists in the Pacific, one of our historic naval captains, David Porter, who, believing in the future importance of the Pacific to America, conquered and solemnly in his country's name took formal possession of the Marquesas Islands, should scarcely be known?

When the war of 1812 broke out, David Porter was already distinguished for daring, resource, and decision of character. In that war, while in command of the *Essex* on the coast of Brazil, he found himself threatened with destruction, starvation, or blockade. Cutting loose from his orders, acting upon his own high sense of public duty, and in the entire ignorance of his government, he evaded British warships searching for him, and sailed to the Pacific. There under, the broad pennon of "Sailor's Rights," he rid the ocean of a fleet of armed British whalers more intent on taking American ships and impressing American seamen than on cutting whale blubber. Finding himself in need of a station for repairs he sailed to the Marquesas Islands.

Here he endeavored to preserve friendly relations with the natives, but these unreclaimed cannibals sought to destroy him. In protecting himself he made war upon the islanders, conquered them after several fierce battles, and then took public possession of the islands as territory of the United States. His act was one of necessity. He needed a naval base and from here fitted out a fleet of cruisers to destroy British commerce. But also, he said: "Besides, I believed that the possession of this island might at some future period be of importance to my country, and I was desirous of rendering her claim to it indisputable."

Had Porter been a British officer his act would doubtless have been approved and he would, at least, have been decorated by his government. He was of just the type of man that has made the island kingdom the great empire it has become. But as an American officer, Porter's act was almost unnoticed, and to-day it is forgotten. Yet, had his government followed up his act and had it assumed permanent possession, consider in what a position of enormous advantage it would have placed our country with reference to the trade routes from the Panama Canal to New Zealand and Australia. Had our government then approved of Porter's act, and were our flag now over the Marquesas Islands, Porter would not only be famous as a brave naval officer, but his appreciative country would honor his memory as one of those far-sighted Americans whose deeds have been of inestimable value to succeeding generations of Americans.

PRESENT STRATEGIC POSITION OF THE UNITED STATES IN THE PACIFIC.

The value to a country from a military point of view of territories beyond the seas depends somewhat upon the wealth and military strength and resources of that country. If the country be poor and weak, unable or unwilling to fortify properly such possessions, the latter must in time of war invite attack by the enemy. If such a possession be properly fortified the fortifications at least will never be attacked. No admiral to-day will risk his ships against modern land fortifications. Many thoughtful men believe that the unsettled conditions in the far east, the scramble for territory, the competition that all commercial nations are making for the large Pacific trade that yearly increases by leaps and bounds, make it probable that the Pacific will be the

scene of national combat at no very distant date. With a long Pacific coast line, with colonies in the Pacific Ocean, as the builder and guarantor of the Panama Canal, and as an aggressive and determined candidate for a share in development of Pacific commerce, it is timely that our position in the Pacific with reference to our ability to protect our country's interests therein be considered.

Potentially we are strong in the Pacific, that is we have the advantage of position in a home base and in outlying points of great strategic value; and we have the wealth, if we can secure the authorization to use it, to make these inexpugnable. We are actually weak because our possessions there are almost entirely undefended. Should war be declared to-morrow by a great Pacific power, should our fleet be absent, our island possessions in that ocean must inevitably be abandoned or surrendered.

Secure on his inland farm, the prairie statesman cannot be made to believe in the possibility of war. He is equally reluctant to comprehend the necessity of spending huge sums to fortify outlying points. When war is actually threatened he is patriotic to the last degree, and cheerfully sanctions on but short consideration, the expenditure of fifty or a hundred millions, whatever may be called for. But in time of peace he will not spend thirty millions on fortifications necessary to render Hawaii or Olongapo secure from attack. If war in the Pacific is forced upon us our fleet must be the enemy's first objective; and in time of war our fleet must have a series of operating bases in secure stations where the ships may go for coal, supplies, and repairs. Without these a fleet of warships cannot long exist. And to keep our fleet efficient such stations must be secure from attack. In the possession of Hawaii our naval strength in the Pacific is immeasurably increased if Hawaii be secure from the enemy. But if the enemy take it and keep it, our naval strength is weakened in the same ratio. Holding Hawaii, our Pacific coast is absolutely safe from attack. And yet Hawaii remains inadequately fortified. Should war be waged in the Pacific in the absence of our fleet, our island possession must succumb, and our fleet must start from ports of our Pacific home base laden with stores and coal; the effect of this may be to make our battleships armored cruisers, for it is well known that the tops of the main armor belts of our battleships is already close to the water-lines, and if the ships be

overladen they will be beneath it. And in each of the days of the first fortnight's voyage under these damaging conditions of overload, the fleet will be exposed to battleship attack from an enemy which has acquired by preliminary conquest of the American territory of Hawaii, a base from which to deliver blows within a five-day radius, and with her own choice of position.

The activity of great powers in any one locality has always presaged conflict. Interests in a growing commerce, and in aggrandizement of territory always threaten peace. One frightful war has but finished, and since then far-reaching alliances in preparation for the next great struggle have been made in the far east, and great fleets of warships have been, or are there, assembling. The Spanish war has made the United States an oriental power with colonial dependencies in the Pacific seas; and great though its potential power may be, should war come to-morrow in the Pacific, unless our fleet be there, our first experience must be disaster, defeat, and national humiliation. And in addition to our territorial position in the Pacific and our defenceless state therein, our weakness will be increased by the creation of the Panama Canal. An enormous volume of trade is certain to pour through that opening, bound to the north, south, and west. Only with an adequate fleet in the Pacific, and with suitable naval stations, properly fortified, will American interests have proper protection. This again accentuates the arguments for the fortification of Hawaii, and it means that a suitable naval station should be created at Tutuila. The southwestern trade routes that will exist when the Panama Canal is opened, again bring David Porter's annexation of the Marquesas sharply to mind. These are in mid-Pacific, and command the Canal and the Pacific coast of South America, much as Hawaii does the coast of North America. To-day one can but regret that the acts and the far-sightedness of this great American conqueror should have been treated with ignorant indifference and neglect. With the commercial routes from the Canal we will have great interests in the south Pacific; troublesome questions are certain to follow commercial extension, and the time is coming when American interests in the south Pacific will be far greater than at present. All of which would make the Marquesas Islands invaluable to us if we had them, and should induce us to hold the name of David Porter in high regard.

For national strength in the Pacific the possession of naval

stations suitably situated, such for instance as Hawaii, is vitally essential. And perhaps a naval station at Guam, or at some one of the Philippine Islands, is also most desirable. But many of our citizens believe that the possession of the Philippine Islands is detrimental to the United States and that the future will never prove them a benefit. From a military point of view they are decidedly a weakness. They do not produce coal or naval supplies. These, and even the food used by our warships in Philippine waters are brought from afar off. No Filipinos are found aboard our warships; we do not depend upon Filipino workmen for repairs, when in Philippine waters.

It cannot be believed that large numbers of American workmen, farmers, or laborers, will ever find permanent homes in these islands. The climate is too hot, and the recompense is entirely too low to attract Americans. Besides, the islands are thickly inhabited, there is an average population of 67 to the square mile in these islands compared with 26 in continental America. Then the laws that regulate the commerce and industry of the Philippines are framed for the benefit of Americans at home, not of Filipinos. It is conceivable that a few Americans, representing the greater aggregations of capital, will make permanent stay in the islands; that here will be engineers, bankers, foremen, and some others there; but these will form but an insignificant per cent of the population. A few Americans at home may draw large incomes from tobacco, sugar, and hemp investments in the Philippines. But the vast majority of the population must always remain of the rice, fish-eating class, and of Malay blood. We have driven away most of the Spanish merchants and Spanish trade, and have passed laws the effect of which is to benefit tobacco and sugar interests at home and to restrain possibilities in these lines in the islands. The trade with the islands is large in the aggregate, yet this depends on other things than the flag which may be flying over Manila. Title to these islands will not affect largely American trade with China, Japan, or other Pacific countries. From a military point of view they are a weakness, not a source of strength. So far as concerns the efficiency of our fleet in war time we should be far better off if we had a secure naval station situated somewhere in these seas, than at present with a territory of over 100,000 square miles, open to attack along an altogether disproportionate

length of coast line, and obnoxious to the enemy's invasion. As for the Filipinos, in spite of what we have tried to do for them in the way of beneficent government, they remain sulky and inappreciative, and long for the good, easy old times of Spanish rule. The possession of these islands has cost our country vast treasure and valuable lives. If our government's title to them is beneficial to neither the islanders nor ourselves, why do we keep them? Such are views frequently heard from Americans.

The answer is that we have them, and it is difficult to determine what disposition of them, other than keeping them, could be made. It is unlikely that the American people will ever consent that they should be disposed of in any way except with the Filipinos' own consent. It may be they will finally attain ability to govern themselves, but the future for this does not at present, at least, look hopeful. Just now they are a military weakness and a heavy expense to our country.

This seems to be wandering from David Porter. But considerations of present conditions in the Pacific must bring to mind Porter's annexation of the Marquesas Islands. His work in the Pacific was to injure British interests. In doing this he destroyed or captured a dozen armed British merchantmen; some of these he converted into American cruisers. He found the possession of a base absolutely essential, and so seized Nukahiva, one of the Marquesas Islands. These are over 3000 miles from the Panama Canal, Samoa being still 2000 miles further on. If to-day we possessed Taiohae, the fine harbor of Nukahiva, we would unquestionably find much use for it in the near future as a naval station. It is admirably situated with reference to the trade routes that will stream from the canal to the south Pacific. Porter's mind was imperial in its conception. He had the prescience to see that American control of the Pacific was essential to the national stability, and this in 1814, when the United States extended even theoretically but little west of the Mississippi.

Hawaii is beautifully situated for our strategic needs in the north Pacific; we are most fortunate that that is American territory. And most advantageously situated with reference to the Panama Canal are the Marquesas Islands. It is now seen to be extremely unfortunate that Porter's annexation of those islands was not made permanent by his government. But past governmental ignorance should not detract from the credit due that great naval commander.

The American government found itself in 1898 assuming essential off-shore positions. It waited 84 years, and then justified Porter's far-sighted act of annexation. But in this long interval Porter's great wisdom was entirely forgotten, and even now our country is in ignorance of what it might have owed to Porter had his government but approved his seizure of the Marquesas Islands instead of leaving them to be gobbled up by France 30 years later. Being ignorant we are necessarily unappreciative, and so Porter is remembered for the gallant fight the *Essex* made against overwhelming odds.

The particular purpose of this paper is to draw attention to what one of our greatest naval captains did in the Pacific Ocean 95 years ago. Recent American history has justified that act and his judgment. It is due his memory that credit should be given him now.

The limits of this paper forbid digression into a most interesting field, the events which led to Porter's official annexation of the Marquesas Islands. But to understand the reason and the necessity for this it seems advisable to quote a part of his letter which outlines his cruise to the Pacific. This same letter includes the report of the *Essex'* defeat, in neutral territory, by two British warships.

AT SEA, *Essex Junior*, July 3, 1814.

Sir.—I have done myself the honor to address you, repeatedly since I left the Delaware; but have scarcely a hope that one of my letters has reached you, and, therefore, consider it necessary to give you a brief history of my proceedings since that period.

I sailed from the Delaware on the 27th of October, 1812, and repaired, with all diligence (agreeably to the instructions of Commodore Bainbridge) to Port Praya, Fernando da Noronha, and Cape Frio, arriving at each place on the day appointed to meet him. On my passage from Port Praya to Fernando da Noronha, I captured his Britannic majesty's packet, *Nocton*—and after taking out about eleven thousand pounds sterling in specie, sent her under command of Lieutenant Finch for America. I cruised off Rio de Janiero, and about Cape Frio until the 12th January, 1813, hearing frequently of the commodore by vessel from Bahia. I here captured one schooner with hides and tallow; I sent her into Rio. The *Montague*, the admiral's ship, being in pursuit of me, my provisions now getting short, and finding it necessary to look out for a supply to enable me to meet the commodore by the first of April, off St. Helena, I proceeded to the island of St. Catherine's (the last place of rendezvous on the coast of Brazil), as the most likely to supply my wants, and, at the same time, afford me that intelligence necessary to enable me to elude the

British ships of war on the coast, and expected there. I here could procure only wood, water and rum, and a few bags of flour; and hearing of the commodore's action with the *Java*, the capture of the *Hornet* by the *Montague*, and a considerable augmentation of the British force on the coast, several being in pursuit of me, I found it necessary to get to sea as soon as possible. I now, agreeably to the commodore's plan, stretched to the southward, scouring the coast as far as Rio de la Plata. I heard that Buenos Ayres was in a state of starvation, and could not supply our wants; and that the government of Montevideo was very inimical to us. The commodore's instructions now left it completely discretionary with me what course to pursue, and I determined on following that which had not only met his approbation, but the approbation of the then Secretary of the Navy. I accordingly shaped my course for the Pacific; and after suffering greatly from short allowance of provisions, and heavy gales off Cape Horn (for which my ship and men were ill provided), I arrived at Valparaiso on the 14th of March, 1813. I here took in as much jerked beef, and other provisions, as my ship would conveniently stow, and ran down the coast of Chili and Peru. In this track I fell in with a Peruvian corsair, which had on board twenty-four Americans as prisoners, the crews of two whale-ships, which she had taken on the coast of Chili. The captain informed me that, as allies of Great Britain, they would capture all they should meet with, in expectation of a war between Spain and the United States. I consequently threw all his guns and ammunition into the sea, liberated the Americans, and wrote a respectful letter to the viceroy, explaining the cause of my proceedings, which I delivered to her captain. I then proceeded for Lima and recaptured one of the vessels as she was entering the port. From thence I shaped my course for the Gallipagos Islands, where I cruised from the 17th of April until the 3d of October, 1813. During this time I touched only once on the coast of America, which was for the purpose of procuring a supply of fresh water, as none is to be found among the islands, which are perhaps the most barren and desolate of any known.

While among this group I captured the following British ships, employed chiefly in the spermaceti whale fishing, viz.:

LETTERS OF MARQUE.

	Tons.	Men.	Guns.	Pierced for.
Montezuma	270	21	2	..
Policy	175	26	10	18
Georgiana	280	25	6	18
Greenwich	338	25	10	20
Atlantic	355	24	8	20
Rose	220	21	8	20
Hector	270	25	11	20
Catherine	270	29	8	18
Seringapatam	357	31	14	26
Charlton	274	21	10	18
New Zealander	259	23	8	18
Sir A. Hammond	301	31	12	18

As some of these ships were captured by boats, and others by prizes, my officers and men had several opportunities of showing their gallantry.

The *Rose* and the *Charlton* were given up to the prisoners; the *Hector Catherine,* and *Montezuma,* I sent to Valparaiso, where they were laid up. The *Policy, Georgiana,* and *New Zealander,* I sent for America; the *Greenwich* I kept as a storeship, to contain the stores of my other prizes, necessary for us; and the *Atlantic,* now called the *Essex Junior,* I equipped with twenty guns, and gave the command of her to Lieutenant Downes.

Lieutenant Downes had convoyed the prizes to Valparaiso, and on his return, brought me letters, informing me that a squadron under the command of Commodore James Hillyer, consisting of the frigate *Phoebe,* of thirty-six guns, had sailed on the 6th of July for this sea. . . . The *Racoon* and *Cherub* had been seeking me for some time on the coast of Brazil, and on their return from their cruise, joined the squadron sent in search of me to the Pacific. My ship, as it may be supposed, after being near a year at sea, required some repairs to put her in a state to meet them, which I determined to do, and bring them to action, if I could meet them on nearly equal terms. I proceeded now, in company with the remainder of my prizes, to the island of Nooaheevah or Madison's Island, lying in the Washington group, discovered by a Captain Ingraham of Boston. Here I caulked and completely overhauled my ship, made for her a new set of water casks, her old ones being entirely decayed, and took on board for my prizes, provisions and stores for upwards of four months, and sailed for the coast of Chili on the 12th of December, 1813. Previous to sailing, I secured the *Seringapatam, Greenwich,* and *Sir Andrew Hammond,* under the guns of a battery, which I had erected for their protection. After taking possession of this fine island for the United States, and establishing the most friendly intercourse with the natives, I left them under charge of Lieutenant Gamble of the marines, with twenty-one men, with orders to repair to Valparaiso after a certain period.

I arrived on the coast of Chili on the 12th of January, 1814; looked into Conception and Valparaiso, found at both places only three English vessels, and learned that the squadron which sailed from Rio de Janeiro for that sea had not been heard of since their departure, and was supposed to be lost in endeavoring to double Cape Horn.

I had completely broken up the British navigation in the Pacific; the vessels which had not been captured by me were laid up, and dared not venture out. I had afforded the most ample protection to our own vessels, which were, on my arrival, very numerous and unprotected. The valuable whale fishery there is entirely destroyed, and the actual injury we have done them may be estimated at two and a half millions of dollars, independent of the expenses of the vessels in search of me. They have supplied me amply with sails, cordage, cables, anchors, provisions, medicines, and stores of every description—and the slops on board them have furnished clothing for the seamen. We had, in fact, lived on the enemy since I had been in that sea; every prize having proved a well-found storeship for me. I had not yet been under the necessity of drawing bills on the department for any object, and had been enabled to make considerable advances to my officers and crew on account of pay. . . . ."

This letter continues with the report of the battle between the *Essex* and the British ships *Phoebe* and *Cherub*, an event outside of the purpose of this paper. This particular purpose is to recall the memory of Porter's annexation of Nukahiva. We have a graphic account of this in Porter's journal, published in 1822.

From beginning to end, this journal is a stirring account of storm and battle, of discovery and conquest. Had Porter been an Englishman he would have ranked with Drake. To-day he would be celebrated in song and story. But as an American, except as the *Essex'* captain in battle, we have almost forgotten him. We remember him in the battle against overwhelming odds, in a neutral port that should have given him protection, where he was defeated. We have but hazy recollection of his stirring services in the French naval war against the Barbary pirates. Of his important duties as senior naval officer at New Orleans in momentous times. Of the protection afforded American ships by the *Essex*, of the injury done British commerce during war time, and finally of that remarkable judgment which indicated to him the future importance of the Pacific, which induced him to seize the island of Nukahiva, in his country's name.

Porter's Journal convinces one that he was a man much of the type of John Paul Jones. He never evaded responsibility and was quick to act in an emergency. In a time of mutiny, surrounded by savages, he controlled the situation, though it would have appalled a less determined character. He did not find it necessary to hang anybody, as did so causelessly, so needlessly, and to our everlasting regret, a later American naval officer.

The act of the annexation of Nukahiva is described by Porter in his journal as follows:

> Everything now bore the appearance of war; the Taeehs and Happahs could talk and think nothing else, and I found it policy to keep this spirit alive, as it was likely to secure their friendship. Apprehensive, however, of a change of disposition on their part, I now conceived the design of constructing a fort, not only as a protection to our village and the harbor, but as a security to the Taeehs against further incursions; and while it enabled us to give to them the most ample protection, would place them perfectly in our power, in the event of any hostility on their part. . . . But before the commencement of this undertaking, I considered it advisable to obtain the consent of the tribes of the valley. I had for some time past intended leaving my prizes here as the most suitable place to lay them

up, and this fort would give them additional security, besides, I believed that the possession of this island might at some future period be of importance to my country, and I was desirous of rendering her claim to it indisputable. With these objects in view, I called on Gattanewa, and inquired of him and his people, who had assembled, whether they had any objections to my constructing the fort. They informed that they were much pleased with my intention, as it would enable me to give them more effectual protection, and requested that they might be permitted to assist in its construction. I now required to know of them whether they would always be faithful to the American flag, and assist us in opposing our enemies. They replied that they had placed themselves entirely under my protection and control, that our enemies should be their enemies, that they would always receive my countrymen as brethren among them, and as far as lay in their power prevent our enemies from coming among them, knowing them to be such. I had frequently informed them of our being at war with Great Britain, and now explained to them the nature of our government, on which Gattanewa requested that they might not only be our friends and brothers, but our countrymen. I promised them that they should be so, and that they should be adopted as such as soon as the fort should be completed, when a salute should be fired on the occasion.

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On the 19th of November, the American flag was displayed in our fort, a salute of seventeen guns was fired from the artillery mounted there, and returned by the shipping in the harbor. The island was taken possession of for the United States, and called Madison's Island, the fort, Fort Madison, the village, Madison's Ville, and the bay, Massachusetts Bay. The following declaration of the act of taking possession was read and signed, after which the prosperity of our newly-acquired island was drank by all present. The object of this ceremony had been previously and was again explained to the natives. They were all much pleased at being Melleekees, as they called themselves, and wanted to know if their new chief was as great a man as Gattanewa.

DECLARATION.

"It is hereby made known to the world, that I, David Porter, a captain in the navy of the United States of America, and now in command of the United States frigate the *Essex*, have, on the part of the said United States, taken possession of the island called by the natives Nooaheevah, generally known by the name of Sir Henry Martin's Island, but now called Madison's Island. That by the request and assistance of the friendly tribes residing in the valley Tieuhoy, as well as of the tribes residing on the mountains, whom we have conquered and rendered tributary to our flag, I have caused the village of Madison to be built, consisting of six convenient houses, a rope walk, bakery, and other appurtenances, and for the protection of the same, as well as for that of the friendly natives, I have constructed a fort, calculated for mounting sixteen guns, whereon I have mounted four, and called the same Fort Madison.

"Our rights to this island being founded on priority of discovery, conquest, and possession, cannot be disputed. But the natives, to secure to

themselves that friendly protection which their defenceless situation so much required, have requested to be admitted into the great American family, whose pure republican policy approaches so near their own. And in order to encourage these views to their own interest and happiness, as well as to render secure our claim to an island valuable, on many considerations, I have taken on myself to promise that they shall be so adopted; that our chief shall be their chief; and they have given assurances that such of their brethren as may hereafter visit them from the United States, shall enjoy a welcome and hospitable reception among them, and be furnished with whatever refreshments and supplies the island may afford; that they will protect them against all their enemies, and, as far as lies in their power, prevent the subjects of Great Britain (knowing them to be such) from coming among them until peace shall take place between the two nations.

"Presents, consisting of the produce of the island to a great amount, have been brought in by every tribe in the island not excepting the most remote, and have been enumerated as follows, viz.:

"Six tribes in the valley of Tieuhoy, called the Taechs, viz., 1 Hoattas, 2 Maouhs, 3 Houneeahs, 4 Pakeuhs, 5 Hekuahs, 6 Havvouhs.

"Six tribes of the Happahs, 1 Nieekees, 2 Tattievows, 3 Pachas, 4 Keekahs, 5 Tekaahs, 6 Muttewhoas.

"Three tribes of the Maamatwuahs, 1 Maamatwuahs, 2 Tioahs, 3 Cahahas.

"Three tribes of the Attatokahs, 1 Attatokahs, 2 Takeeahs, 3 Paheutahs.

"Nieekees, one tribe.

Twelve tribes of the Typees, 1 Poheguahs, 2 Naeguahs, 3 Attayiyas, 4 Cahunukokahs, 5 Tomavaheenahs, 6 Tickeymahues, 7 Mooaeekas, 8 Atteshows, 9 Attestapwyhunahs, 10 Attehacoes, 11 Attetomohoys, 12 Attakakahaneuahs.

"Most of the above have requested to be taken under the protection of our flag, and all have been willing to purchase, on any terms, a friendship which promises to them so many advantages.

"Influenced by considerations of humanity, which promise speedy civilization to a race of men who enjoy every mental and bodily endowment which nature can bestow, and which requires only art to perfect, as well as by views of policy, which secure to my country a fruitful and populous island, possessing every advantage of security and supplies for vessels, and which, of all others, is the most happily situated, as respects climate and local position, I do declare that I have, in the most solemn manner, under the American flag, displayed in Fort Madison, and in the presence of numerous witnesses, taken possession of the said island, called Madison's Island, for the use of the United States, whereof I am a citizen; and that the act of taking possession was announced by a salute of seventeen guns from the artillery of Fort Madison, and returned by the shipping in the harbor, which is hereafter to be called Massachusetts Bay.—And that our claim to this island may not be hereafter disputed, I have buried in a bottle, at the foot of the flagstaff in Fort Madison, a copy of this instrument, together with several pieces of money, the coin of the United States.

"In witness whereof I have hereunto affixed my signature, this 19th day of November, 1813.

"Signed, DAVID PORTER.

"Witnesses present:

"Signed, John Downes, lieutenant, U. S. N.
James Wilmer, lieutenant, U. S. N.
S. D. M'Knight, acting lieutenant, U. S. N.
John G. Cowel, acting lieutenant, U. S. N.
David P. Adams, chaplain, U. S. N.
John M. Gamble, lieutenant, U. S. Marines.
Richard K. Hoffman, acting surgeon, U. S. N.
John M. Maury, midshipman, U. S. N.
M. W. Bostwick, acting midshipman, U. S. N.
William Smith, master of the American ship Albatross.
William H. Odenheimer, acting surgeon master U. S. N.
Wilson P. Hunt, agent for the American North Pacific Fur Company.
P. de Mester, Benjamin Clapp, } Citizens of the U. States."

The most formidable tribe in the island Porter annexed were the Typees. They were the greatest in number and in wealth. Hardly had the act of annexation been accomplished than they regretted their alliance with Porter, and in a few days they were guilty of hostile acts. They, the Typees, made war on Porter's particular friends, the Taeehs and the Happahs, and Porter made an attempt to effect reconciliation; instead of this resulting peacefully, Porter was attacked by the Typees, and for his own protection, and for the sake of the friendly tribes, he made war upon them. His first attack, from seaward, was unsuccessful.

Porter's force consisted of thirty-five of his own men, and five thousand native warriors; he supposed this would be sufficient. But the fierce Typee warriors descended upon him with fury, and in a short time all of his native allies had deserted in a panic, and Porter had a difficult task, which was to beat a safe retreat; this was successfully accomplished.

But this temporary defeat rendered it vitally necessary, either to subdue the truculent Typees, or else to abandon the island. The Typees were now triumphant, and the friendly tribes became lukewarm.

Porter now gathered his whole force of Americans, two hundred men, and marched upon the Typees. The latter, many thousand strong, assaulted him furiously, but were everywhere defeated. In three days Porter had marched sixty miles, had

destroyed the Typee forces, and had laid waste their country. The march was full of difficulties. It was over knife-edged mountains, down headlong valleys, under the pelting of torrential rains, and through tropical jungles. But at the end the warlike Typees had no greater ambition than to be on terms of friendship with Porter.

For the rest of Porter's stay peace reigned on the island.

Porter in the meantime had been refitting his ships, preparatory to another descent upon the British interests in the Pacific, and on December 9, 1813, he set sail for Chili.

Three officers and twenty men were left on the island, Lieutenant Gamble being in command. Some of these became enamored of the lazy island life and restive under the discipline enforced by Lieutenant Gamble. These instituted a mutiny, in which some natives joined them. Murder and anarchy followed, and Lieutenant Gamble and seven men were barely able to escape in the *Sir Andrew Hammond*, all except two of them wounded or ill.

Thus vanished American authority over the Marquesas Islands. Nukahiva was never reoccupied by an American force. Some thirty years later it was annexed by France without notice being taken or protest made by the United States government.

Had Porter's annexation been followed by permanent occupation the United States government would to-day be in possession of islands commanding the south Pacific with respect to its American shores as Hawaii commands the north Pacific. These islands, with their fine harbors, and directly in the line of future travel from the Panama Canal to Australia and New Zealand, would be invaluable to a country that intended to have a share in the trade of those regions.

It is present day conditions that make one regret that the value of Porter's forgotten act of sovereignty was not appreciated by his government.

Becoming much impressed with the far-sightedness of Porter's conception, the writer has endeavored to ascertain what his contemporaries thought of it; and it must be regretfully recorded that there is no evidence whatever obtainable that Porter's act of annexation was even considered by them. A long search was made without results of any nature.

Every encyclopedia was examined; the few that even referred to it used Porter's Journal as their authority. In the 1,500,000

volumes in the congressional library, but five or six touch on the Marquesas islands, and these, except Porter's Journal, hardly refer to the American annexation; and where they do their facts come from the journal. Of these five or six volumes in that great library that are written about the Marquesas Islands, it is only the one entitled "L'les Marquises," by Vincendon-Dumoulia and Graz, that speak of Porter's annexation. These Frenchmen got their facts from Porter's Journal, and from their comments it is fair to presume they were not sure the American rights to Nukahiva were extinguished. The purport of their comments is unmistakably to enforce the view that Porter had done nothing which Dupetit-Thouars, who seized them for France, was at all bound to respect.

The comments referred to are as follows:

Page 44: "Le but du capitaine Porter était de mettre en sûreté les prises qu'il avait faites sur les Anglais et de procurer quelques repos à son équipage, lorsque le 23 octobre 1813 il vint former un établissement temporaire dans la baie Taio-hae."

Page 177: "La plage de l'est est dépourvue d'habitations et d'habitants; c'est celle que les Américains avaient choisie pour établir leur camp, auquel ils imposèrent le nom pompeux de Madisonville."

Page 367; "Le contenu emphatique et pompeux de cette pièce (Porter's declaration of annexation) nous a engagés a la produire comme un spécimen remarquable du style américain. Nous aurions pu annexer à cette note d'autres documents de cette nature; car, Dieu merci, les îles Nouka-Hiva n'ont pas manqué de découvreurs et de prises de possession; mais le temps nous manque, et nous les croyons, pour le moment du moins, inutiles à notre sujet."

The archives of the Navy Department were carefully searched. In them many letters to and from Porter were read, but no reference whatever except the one already quoted in the report of the battle where the *Essex* was defeated by the British, is to be found.

The archives of the State Department were examined, with the sole result of the following letter:

CHESTER, February 27, 1815.

Sir.—I have the honor to enclose you the original declaration of taking possession of Madison's Island (called by the natives Nooaheeva) situated in the South Pacific Ocean.

The climate, fertility, local situation, friendly disposition of the natives, and convenience of this island promise to make it at some future day of great importance to the vessels of the United States navigating the Pacific.

And under this impression I considered it a duty I owed my country to use every effort in my power, to secure to her an indisputable title to it.

Allow me to request of you an acknowledgment of the receipt of this paper, and be pleased to accept assurances of my highest respect and consideration.

I have the honor to be,

Your ob't. Hble Servt., D. PORTER.

HONBLE JAMES MONROE,
Act'g Sec'y of State.

The original declaration referred to in the above letter is missing.

This letter, unlike the letters that are preserved with it, has no endorsement of having been answered.

To us, to whom the United States has always meant the continental width of America, with the Pacific as much home water as the Atlantic, it comes as a shock when the eye falls upon the name of the principal officer of the Cabinet to whom this state paper is addressed. A document which we should estimate as one of the great national muniments of title from which the chain of sovereignty was to devolve seems to have been considered unworthy of even so much recognition as would be involved in a perfunctory acknowledgment of receipt; and its essential enclosure was not secured against the drift to the shakings barrel. Yet James Monroe, so blind to the Pacific which Porter had swept of the foe and delivered to his native land as a solemn possession, was that Monroe whose eye upon the Atlantic blazed with the inspired prevision of an America from Baffin's Bay to the Horn upon whose soil European might should set no hostile foot.

Contemporary publications of the State Department have been examined, as were also congressional records, and foreign and domestic magazines of the time; the purpose was to ascertain what our government, or what other governments thought of Porter's annexation of the Marquesas, and what our citizens at home thought about it; but it must be regretfully recorded that from an exhaustive examination of all evidence and sources obtainable, nothing whatever was thought of his far-sighted, patriotic act. And but for his own journal, published in 1822, and now seldom read, it would be entirely forgotten.

The writer believes this paper to be a definitive statement of a remarkable though forgotten chapter in this country's history. Had Porter's compeers equalled him in breadth of vision, to-day

the United States would be in possession of a magnificent harbor on the trade routes to be established midway between the Panama Canal and Samoa, which would have given us a commanding position with reference to the commerce of that Canal, and a most valuable naval station.

It was not Porter's fault that his annexation of Nukahiva was not followed by permanent occupation, nor is it just to his memory that this really great and far-sighted act should be forgotten.

Mr. William Churchill, formerly United States Consul-General to Samoa, who spent many years in the South Seas, studying the various languages of that region, of which he is probably the greatest philological authority that has ever lived, has inspired this paper. At one time in a visit to Nukahiva, Mr. Churchill dug up the remains of Porter's old fort, hoping to find the copy of the declaration that Porter buried there. In this he was disappointed, Herman Melville, many years ago drew attention to Nukahiva by his charming book, "Typee," which was the story of a beach-comber's experiences on that island. But it is evident that Melville was in ignorance of Porter's occupation.

Appended to this paper is a letter written by a British naval officer in 1816. Though rather long it is well worthy of perusal because it proves that there were others besides Porter who foresaw the future importance of the Pacific. The particular purpose of this letter was to acquaint the British government with this importance, and to urge it to establish its authority over the Hawaiian Islands. But the British government of the day was as deaf to Commander M'Konochie as it was ignorant of its own interests. Had Commander M'Konochie's advice been followed, to-day the Hawaiian Territory would be British instead of American. As proof that both Porter and M'Konochie, who were contemporaries, possessed wisdom far in advance of their day, it may here be recalled that in his "Narrative of the United States Exploring Expedition" of the early forties, Captain Wilkes went to some length to prove that possession of the Hawaiian Islands could never be of naval advantage, strategically or otherwise to the United States.

This letter has recently been republished in the "Fourteenth Annual Report of the Hawaiian Historical Society." It as follows:

CONSIDERATIONS ON THE PROPRIETY OF ESTABLISHING A COLONY ON ONE OF THE SANDWICH ISLANDS.

By ALEXANDER M'KONOCHIE, ESQ., COMMANDER ROYAL NAVY.

(Written in 1816.)

Submitted to the consideration of the Right Honorable the Secretary of State for War and Colonies, and the Lords Commissioners of the Admiralty.

That the views of the government of the United States are fixed on the rebellion of the Spanish colonies in their neighborhood, will not appear doubtful, when we consider many particulars in their conduct, the supplies which they covertly afford them, and, still more, the avidity with which, even in their present distressed circumstances of finance, they would seem to court a rupture with old Spain. The vain and empty acknowledgment of their sovereignty over West Florida would not alone seduce them to this deviation from the Pacific line of policy best suited to their situation, were it not reinforced by the prospect of other, and more considerable advantages, connected with the right of openly assisting the insurgent colonists and of profiting by their success.

These advantages are indeed not illusory, nor the prospect of their acquisition vague and uncertain, should the present contest end either in the emancipation of these colonies, or in a compromise in favor of their trade. The communication with the South Sea, which is now maintained by a painful and laborious passage round Cape Horn, would be abridged by the acquisition of a free passage for commerce over the Isthmus of Panama, in a degree which would seem to warrant even the most sanguine anticipations. The distance to China would receive a proportional diminution, at the same time that the equivalents, furs and specie, which are offered in the Chinese markets for their commodities, would be presented under advantages which would very peculiarly contrast with the circuitous and expensive route by which our East India Company convey thither the same articles. The supply of Europe with East India produce must be speedily engrossed by a commerce thus supported; nor should we have any reasonable prospect of success in competition with it, unless either by a precarious share in its advantages, dependent upon a thousand casualties of favor, interest or ambition, or by an appeal to that last resort, the force of arms, to which, without an established port on the spot, we should apply under very serious disadvantages, and with very alarming responsibilities. Success might, for a time, and at very considerable expense, sustain our own more circuitous line of commerce; but the maritime resources of the western shores of America are considerable, and would be peculiarly pointed against us by the habits, the animosity, and the policy of the United States; nor would the consequences of failure probably rest in the Pacific Ocean.

While such is the alluring prospect on which the views of the government of the United States would seem to be fixed, we, on the other hand, are precluded by the peculiarity of our circumstances, from interfering in our position to them on the spot to which they are most immediately

directed. In the contest between Spain and her colonies, we can neither league our fortunes with the feeble exertions of the mother country, nor, consistently with our alliance with her, and still more with the benefits we have so recently conferred on her, can we imitate the perfidious policy of France towards ourselves in 1778, which, in the importation of republican principles into her own bosom, was visited by so severe a measure of chastisement on her head. But though thus precluded from opposing them in their immediate direction, it is both imperiously our interest, and most unquestionably our right to prepare to cope with them in their ulterior operation.

It is the object of the following considerations to show, that such preparation will materially consist in establishing a colony in the Sandwich Islands; while, at the same time, such a settlement, even if not required in that point of view, would seem to hold out to us the prospect of commercial advantages of the most important and alluring nature. The interests of this country would therefore seem equally connected with it, whatever may be the result of the present contest in New Spain; while upon the question of our right to take such a step, in addition to our claim on the Sandwich Islands arising from the priority of discovery, the usual foundation of such claims, we superadd the voluntary and solemn cession of the sovereignty of Owyhee to this country, which Captain Vancouver received in 1794 from Tamaahmaah, its supreme chief; a transaction precisely similar to that on which Spain so long founded her claim on Noottka, to the prejudice of the more ordinary plea.

The arguments by which I would endeavor to recommend this settlement I have thus the honor to propose, naturally divide themselves into a consideration of the military and commercial advantages which would seem connected with it.

I. *Military Advantages.*—1. The first military advantage is best illustrated by a reference to what has been already advanced; a recapitulation of the circumstances, attending the commerce and navigation between New Spain and the East Indies; and a consideration of the geographical position of the Sandwich Islands in relation to them. The intercourse between New Spain and the East Indies is confined in its passage to the westward, to the strength of the trade winds, in about 12° and 14° north latitude, and to the eastward, to that of the westerly winds which prevail in from 35° to 40° or more, also north latitude. It is to be further remarked that the passage from China to the eastward is more peculiarly confined to the high north latitudes thus denoted; because, although westerly winds equally prevail in the high southern latitudes, yet the calms under the line, currents and prevalence of northerly winds at all seasons, under the high land of New Spain, render it not merely inexpedient, but even utterly impracticable to establish a habitual communication in this direction. The Sandwich Islands, lying in about 20° north latitude and 155° west longitude, placed about one-third over from America towards China, and between these two tracks thus appropriated to the intercourse between them by the laws of nature, the Sandwich Islands, in this situation, equally command both passages, form the key to the whole communication, and stand

to these several coasts in nearly the same relation which the British Isles themselves bear to the north of Europe; the Cape of Good Hope and Ceylon to India; more and Gibraltar to the shores of the Mediterranean, and the Bermudas to those of the Atlantic.

The occupation of such a post must indeed be interesting to Great Britain, whose whole monopoly of the supply of Europe with East India produce, must be at the mercy of the masters of the isthmus of New Spain, unless she be possessed of the means of arresting, modifying, or engrossing also their supply. Were their intercourse with China and the East Indian Islands extended by their own means, or by those of a rival power, so that Porto Bello or Vera Cruz became entrepots of their productions, the convenience of the voyage, and the cheapness of the merchandise, would attract thither all the speculation of Europe; and the blockading of these ports, the only resource left to us if excluded from the Pacific, would only again make our belligerent rights the subject of angry and invidious discussion among the neutral powers. The intercepting this commerce in the Pacific, would not be productive of the same effect; the precarious nature of the supply would keep up the prices in the isthmus; and while, in time of peace, our own merchants and colonies would equally profit by the shorter passage, in time of war its advantages would be equally forfeited by our commercial rivals.

2. The security of our East India possessions would seem to require an outpost to the eastward. The exaggerated importance attached by public opinion to the French expedition to Egypt, and the consequent depression of East India stock, are both within our immediate recollection; but our alarms have never, in an equal degree, been excited to the eastward, from the supineness of the adversary whom we have there had to encounter. Yet had the Isthmus of Panama belonged to either the French or the Dutch; had the first consul transported thither the army he sacrificed at St. Domingo, and thereby acquired the command of the immense maritime resources of its western shores, the weakness of our barrier in this direction would have long since excited our jealousy and alarm. We can now neither calculate on the restoration of this isthmus to its former possessors, nor on their continued supineness; it is time therefore to look to our own strength only for security.

3. As I shall presently endeavor to show, such a settlement would immediately give fresh life and vigor to our now languishing commerce in the Pacific Ocean. A new and extensive nursery would be thereby formed for our seamen; an object of peculiar import at a moment when the reduction of our fleet has dismissed many from our public service, and much discouragement, and even distress, have in consequence ensued among them.

4. Besides a nursery for British seamen, a very important supply of natives would be procured for our service. The Sandwich islanders show a marked propensity to nautical pursuits, and instead of reaping only disease and desolation from their intercourse with Europeans, have made a leap towards power and consequence in these seas altogether incredible. In 1794, Captain Vancouver laid down for Tamaahmaah, their chief, the

keel, thirty-six feet long, of his first vessel; in 1803, Mr. Turnbull found the same prince in possession of twenty vessels of from 25 to 70 tons burthen; and in 1810 Campbell describes him surrounded with native artisans of almost every description, and numbering a navy of fifty sail, of which one was a ship of 200 tons burthen. The acquisition of the resources, moral and physical, by which such a miracle had been accomplished, is indeed an object of secondary, but yet considerable importance.

Lastly. The possession of a settlement in the Pacific Ocean becomes daily more interesting, both in a military and commercial point of view, from the progress of the Russian settlements on the southeast coast of Tartary, and northwest of America. Dependent as we are in a great measure on Russia for our naval supplies, it becomes most interesting to us to know by what arms she may be assailed to advantage, or by what means the effects of her hostility may be eluded, should the friendship and confidence now subsisting between the two powers ever suffer diminution. In this latter point of view, the more particular survey and application of the maritime resources of New Albion, of which Captain Vancouver speaks in very high terms, become objects of considerable relative importance; and it is worthy, too, of record, that the Russians have already directed their attention to the Sandwich Islands. In 1809, when Campbell was in Alexandria on the island of Kodiak, encouragements were held out to adventurers willing to form a settlement in them; and though the plan proved then abortive, probably from deficiency of population to sustain an emigration, it yet holds out too many allurements to be altogether laid aside. A timely interposition now, in favor of our unquestionable rights, may save some future angry discussion; and as the Russians only look to the Sandwich Islands for supplies of provisions, the acquisition of that branch of commerce might prove a new bond of union between the two empires.

II. *Commercial Advantages.*—To explain the full extent of these, it will be necessary to consider the prevailing obstacles which have hitherto paralyzed our commercial exertions in the Pacific Ocean. These arise principally from the isolated object, and limited range of resources with which, on account of the extreme distance, and utter want of a colonial court, merchants have been obliged to prosecute their speculations. The fur trader is unable to combine any secondary object with his principal pursuit; his time on the coast is equally limited by the season and by his inability anywhere to recruit his supplies. He is dependent on Canton for a market, on the East India Company for a homeward bound cargo, and should he lose any men by sickness or desertion, he is utterly unable to replace them. The whaler, in like manner, makes the tour of the globe to catch nine or ten fish, happy if the result of his voyage, administered in all its details with the most scrupulous economy, reward his enterprise by even a moderate profit. So uncertain is he of this result, that he pays his seamen, not by fixed wages, but by shares in the net proceeds, a method not less dictated by the uncertainty of his returns than by his desire to ensure their continuance in his service, and to interest them in the success of

their perilous employment. He is nearly equally limited with the fur trader in his range of speculation, and equally destitute of the means of supply in cases of accident or distress.

Under such circumstances it is not extraordinary that the British share of the commerce of the Pacific Ocean should be small; that the fishing of the spermaceti whale should be alone pursued, that of the black whale being utterly unable to defray its expenses; and that of the fur traders who enter the port of Canton, four-fifths should be Americans, who are encouraged to this perseverence, partly by greater economy in the details of their voyages, partly by their higher appreciation of minute profits, but more than all by their habitual application of the resources afforded by the Sandwich Islands. In 1793, Captain Vancouver found three American seamen left by their employer at Waohoo, on permanent wages of eight dollars a month, to collect for him a cargo of sandal wood, and the necessary refreshments on his return. In 1803, Mr. Turnbull found several of them established about the person of Tamaahmaah, and holding positions of trust under his government; and in 1810, Campbell counted at one time sixty white persons at Waohoo, now become the residence of that prince. It is true, they still respected the British flag displayed by him ever since his acknowledgment of the supreme sovereignty of Great Britain; and equally true, that the greater number of these men were English deserters and refugee convicts from New South Wales. But it cannot be doubted that among a rude people personal affection, cemented by the interchange of commercial benefits, will far outweigh any abstract attachment to a flag; and we are not now to learn that renegade Englishmen, of whatever description, become in principle and views, Americans of the worst and most hostile description. The proof and extent of the danger are contained in the comparative statement of the intercourse maintained. In 1810, of twelve ships which touched at these islands, two were English, one Russian, and nine Americans.

The following are some of the principal commercial advantages which would seem attached to the establishment of a British settlement at the same place. They are calculated principally on the supposition of the Isthmus of Panama remaining shut to commercial enterprise; the supposition on which the acquisition of some of the military advantages above detailed would seem least conspicuously desirable.

1. The whale fishing would be prosecuted in vessels belonging to this new colony. The fishermen would also belong to it; and these bold, adventurous seamen would be constantly employed in those functions, of which their skill and intrepidity secure to them the monopoly instead of passing, as they do now, the greater part of their time in a laborious passage to and from the scene of employment. They would boil their oil and purify their spermaceti on the spot, and reduce them to their most portable state before embarking them in the vessels destined to convey them to Europe.

2. Vessels destined for cargoes of oil and spermaceti would proceed to a known port for their lading. They would carry out with them the goods destined for the prosecution of the fur and other traffics, which

would be either the venture of their owners, or consignments for the colony. In either case, the profits on their sales or freight would form an important item in the credit-account of the voyage, would reduce the scale of its relative expenses, and would enable the black whale fishery to become again a lucrative object of mercantile speculation.

3. The expense of carrying the goods to the place of barter would be proportionally diminished, when their transport became no longer the sole object of the voyage. Higher priced goods might consequently be sent, and a demand created for the more expensive and profitable productions of the British manufacturer's industry. At present, the whole gross profits of the trade, exceeding in many cases 2000 per cent, are absorbed in the merchant's bill of expenses; he is unable to export more than the coarsest articles, which sustain a severe and even successful competition from the imperfect Russian and American manufactures.

4. The fur trade, conducted under the immediate inspection of those most interested in its success, would discover new channels of communication, both with the places where furs are procured, and where they are disposed of.

The establishment of furriers and manufacturers on the spot would enhance the value of furs in the Chinese market, and probably increase their demand.

5. A considerable portion of the price paid by the East India Company at Canton for their investments, is in specie. This specie is presented in the Chinese market under every possible disadvantage. It is purchased in the English bullion market, subjected to the multiplied expenses of two or three times landing and reshipping, and it is then transported to Canton by a voyage exceeding 20,000 miles in distance, and demanding from 4 to 6 months in its prosecution. Under such circumstances, it is not to be doubted, that it costs the company at least double its nominal value at Canton. A portion of this disadvantageous exportation would be obviated by this new colony. The colonists would obtain a very large credit in China from their importations of furs, naval stores, etc., beyond what they would require to vest in commodities, and would very gladly complete the circle of their communications with the mother country, by accepting the company's bills on terms mutually advantageous. The progressive growth of this resource, interesting even in its infancy, would become peculiarly so, when the increased intercourse with the Spanish colonies in America should open that rich and inexhaustible market for East India manufactures and productions, with which accordingly, instead of bills, the company would soon purchase this accommodation. Without an intermediate establishment, our East Indian possessions, situate so far to the westward, would have no chance of obtaining this vent for their productions; the supply of the Spanish colonies would either again revert to the Philippines, or pass to the Dutch islands; by means of it, our activity, capital, and superior maritime resources would secure to us its almost exclusive possession.

6. The necessity under which all vessels bound for the Pacific now labor, of equipping in England for two or three years, is one of the greatest hard-

ships imposed on them, and would be, by means of this settlement, obviated. In voyages of such duration, more stores are expended by rot than by service, and of those which remain to be brought into use half the efficiency is perhaps cancelled by want of some corresponding article of equipment. The obviating this embarrassment is not less a military than a commercial object; and in the event of a future war with either of the Americas, with Spain, with Russia, with China, in a word, with any conflicting interest in that hemisphere, may prove of an importance it may be impossible too highly to appreciate, and proportional only to the stake for which we may be called on to contend.

It would be very easy to extend this enumeration to an indefinite length; to include in it the extension of hydrographical science, the communication of the instruments of luxury and convenience to the rude nations of the Pacific, the consequent increased demand for our manufactures, with many other objects of equal importance to this country. But if I am correct in what I have already advanced, my argument would acquire no additional strength from such a trespass on the attention with which I hope to be honored. I will only solicit permission to make one more remark. These commercial advantages are only calculated on the improvement of already well-known objects of mercantile speculation; but it is beyond a doubt that the establishment of a vigorous and enterprising colony on the spot would soon create or elicit many more. The demand which the liberal supply of the Spanish colonies would occasion on our East Indian possessions for their manufactures and productions; which the existence of this colony would create our New South Wales for its surplus agricultural produce, our New Albion for naval stores, on South America for the precious metals; the facilities it would afford for a contraband trade with these coasts, while they continue subject to the exclusive restrictions of the mother country; for its free prosecution on their repeal; these form a very imperfect enumeration of the various sources of lucrative traffic, which an attentive examination of the statistics of these regions would suggest, and to the pursuit of which such a settlement would give immediate vigor and activity. Nor can its distance be a reasonable ground of objection. Should a passage ever be granted to commercial enterprise over the isthmus of New Spain, the facilities of communication would be infinitely superior to what we enjoy with any of our East India possessions; and even should that remain forever shut, the passage round Cape Horn, divested as it now is of its imaginary terrors, if provided with a good colonial port at its conclusion, would become the mere object of every-day undertaking.

To conclude, I believe I may not with propriety enlarge on the many circumstances in the present state of politics in the world, not merely favorable to the execution of such a measure as this of which I have thus considered the advantages, but also incentive to its undertaking. I may be allowed, however, to make the three following remarks:

First. Spain, uncertain of ever recovering her colonies, can now neither feel nor testify the same jealousy of such a settlement as she expressed on occasion of those at Nootka and the Falkland Islands. Secondly. The

dispersion and animosity of the French exiles render the importation of politics hostile to the interests of Great Britain into New Spain now more than ever probable, particularly when connected with their favorable reception in the United States. And lastly, the chain is at present broken between New Spain and the Philippine Islands, while, by our recent treaties, those islands in the Chinese seas are restored to our old and active commercial rivals, the Dutch, which, from proximity of geographical position, will more naturally fill up the chasm than our East Indian possessions, unless supported and assisted by some strong measure on the part of the government. That measure can only be the interposition of an intermediate settlement.

In the memoir of government, of which I have thus detailed the substance, it would not have become me to propose limits to the scale on which such a plan should be undertaken; and I indeed professed my inability to speak with precision on the point. I presumed, however, to state, that I BELIEVED I could undertake to answer some of the civil and most of the military demands, of the *peaceful infancy* of such a settlement, from the resources of one of our large troop-ships aided either by one or two men of war, or furnished with such additional number of officers and men as might enable me to equip two or three tender for the conveyance of orders and maintenance of authority among the islands. I beg permission to represent that very few of the difficulties would intervene here, which made the infancy of the settlement of Port Jackson so burdensome and expensive. This would be a commercial, not an agricultural, colony. The inhabitants are already friendly, provisions already abundant, nor would the increase of the permanent population be so rapid as to preclude the necessary preparations. I beg leave here to repeat the sanguine belief which I there state, that from the first hour of our settlement we should depend on the mother country only for her manufactures and her protection.

These opinions and speculations may be erroneous, and I now submit them with the diffidence of one unaccustomed to hazard the communication of his sentiments on public service. I hazard them, however, actuated by a most sincere interest in the greatness and welfare of my native country; by an intimate conviction of the importance of the revolution now under contest in New Spain, and by the belief, that however that may now terminate, Spain can only long retain her influence in that country, by the improvement and encouragement of its many natural and commercial advantages, not by their oppression. With these concurrent motives, I will not deny, there is also mixed up a very ardent desire of recommending my own personal services to those who alike dispense the toils and the rewards of individual ambition; a very anxious wish to be employed in the execution of this, or of any other plan which His Majesty's Ministers in their wisdom may adopt, for the maintenance and promotion of British interests in these seas.

ALEX. M'KONOCHIE.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE TRUE STORY OF THE *AMERICA*.

By ROBERT W. NEESER.

It seems very strange that in the history of so young a nation as the United States of America, the historian is often unable for a long time to ascertain the true trend of affairs, and in no few cases absolutely unable to find out the truth in regard to important facts and events. Above all is this true of the American naval historian; and of no period in our naval history of a hundred and thirty-two years more than that of the Revolutionary War. So many valuable records have been lost or destroyed that it is often impossible to confirm absolutely statements authors have made about the navy of that time. Last winter while searching through the files of the Navy Department records in Washington for material relative to the history of some of our vessels of war, a casual mention of one of the resolutions of our Continental Congress, and, some time later, an inquiry upon the same subject by a naval officer, put me on a track, which, though somewhat intricate, I am glad to say, has resulted in the complete clearing up of the mystery which has up to the present time shrouded the history of the first line-of-battleship of the American Navy.

Toward the close of the second year of the Revolutionary War, on November 9, 1776, Congress ordered the construction of three ships of 74 guns, one of which, named the *America*, was laid down at Portsmouth, New Hampshire. This was not only the first line-of-battleship built by the United States, but the first ship of that class ever built on the American Continent.

Work on the vessel does not seem to have been begun until six months later, and then, under the direction of Colonel James Hackett, her master-builder, but slow progress was necessarily made, as he had only twenty-four carpenters at work upon her.

No mention of the *America* is again made in official documents until June 23, 1779, when Congress authorized Robert Morris to take measures for speedily launching and equipping for sea the *America*, then on the stocks of Portsmouth, N. H., and three days later, by unanimous resolution appointed Commodore John Paul Jones to command her.

We fortunately have from him the following description of her, our first line-of-battleship, as completed under his supervision:

Length on the upper gun-deck.....	182½ feet.
Length of keel for tonnage.....	150 "
Extreme breadth	50½ "
Depth in the hold.....	23 "
Burthen, in tons	1,982 tons.
Lower-deck battery	30 long 18s.
Upper-deck battery	32 long 12s.
Quarter-deck and forecastle.....	14 long 9s.
Full complement	626 officers and men.

She was, therefore, the largest 74-gun ship built up to that time, though her lines were so delicately moulded and her sheer so clean that, with her lower-tier ports closed, she presented at the distance of a mile the contour of a heavy frigate.

* * * * * * * * * * * * * *

On leaving Philadelphia I had been given to understand that the *America* was nearly ready for launching. But on my arrival at Portsmouth I found her not planked much above the bilges, no work done toward her decks except the beams, and only twenty-four ship-carpenters employed on her. Their work was much impeded by want of iron for fastenings, as the materials of that kind attainable were intended for smaller ships and could not be used in her. The spar-work was no more advanced than the rest, and no provision whatever had been made for rigging and sails.

Money to buy supplies and pay wages was also lacking, the sum appropriated by Mr. Morris, minister of finance, to that object having been diverted to the far more important and pressing use of the operations against Lord Cornwallis in the south. I at once reported these facts, but was told to proceed as best I could for the time being. The patriotism of the good people of Portsmouth placed some resources at my disposal, and I was otherwise able to obtain much-needed material and even part of the skilled labor on terms of credit which I was authorized by the Honorable John Langdon to arrange in the name of Congress on his personal security. Yet the work progressed slowly.

I do not hesitate to say that the task of inspecting the construction of the America was the most lingering and disagreeable service I was charged with during the whole period of the Revolution. The situation was further aggravated in the spring of 1781, when the enemy, ascertaining

that there was a prospect of the *America* being completed, contrived various schemes for her destruction. The one of which I had most reason to stand in fear was that of landing in force from their squadron, seizing the ship-yard by a night coup de main, setting fire to or blowing up the ship on the stocks, and then making good their retreat. To meet this danger I arranged with the workmen to mount guard at night, by reliefs, taking my turn as officer of the guard, and paying the men something extra for their guard-service. On several occasions large whale-boats full of men came into the river at night, but did not attempt to land on the island, at the lower end of which I had two old six-pounders mounted. Twice shots were fired at boats reconnoitring too closely. The townspeople also assisted in the guard-duty.

As the work proceeded I made several changes in the plans of the vessel, mostly as to the arrangements of the upper-works, and the spar-plan. I caused the main-mast to be stepped three frames further aft than in the original plan; because if stepped according to that plan it would bring the centre of sail-effort too close to the centre of resistance of the ship's side, thereby making her heady when close-hauled, and also greatly diminishing her power to hold a luff.

The original plans had provided to make the waist long and shallow, with narrow gangways, and the quarter-deck and forecastle to be short; also to have a large and cumbrous stern-gallery. Instead of this I carried the quarter-deck forward, to break four feet forward of the main-mast; and I brought the break of the forecastle considerably aft, besides carrying up the topsides in the waist flush with the upper deck sheer. I then carried broad gangways on either side of the waist, of equal height with the quarter-deck and forecastle, leaving just room for the boats on a skid deck between the gangways. Then, clear around all, from stem to stern, I carried a low bulwark of stuff thick enough to stop grapeshot. I also dispensed with the heavy stern-gallery, making only two light and small quarter-galleries, and the weight thus saved I utilized by springing a light poop-deck, carried forward to a point eight feet ahead of the mizzen-mast. Around the poop-deck I carried a light bulwark arranged to fold down on the deck. I also doubled all the bow and stern planking, to aid in resisting raking fire.

The figure-head I planned was a female figure, the Goddess of Liberty crowned with laurels. The right arm was raised with the forefinger pointing to heaven as if appealing to that high tribunal in behalf of the justice of the American cause. On the left arm was a blue buckler with thirteen silver stars. . . . .

The difficulties of my task were much increased by the fact that neither the master-builder, Major Hackett, nor any or his workmen had ever worked on so large a ship, and were therefore, from want of experience, unable to make out the necessary calculations as to scantling sizes or strength of fastening required. However, the leading shipwright, Mr. William Hauscom, though never before working on any ship larger than the *Alliance*, which he had helped to build, took up these questions with more address than any of the others, and soon relieved me of these perplexing details.

I had anticipated much difficulty in mounting the battery. But just at the nick of time I was joined by my old gunner, Mr. Gardner, who had then recently returned from a great privateering cruise with Fanning and Mayrant in French ships, from St. Maloes in the spring of 1780. Had I been permitted to choose, I would have selected Mr. Gardner, in preference to all others I knew, for this particular service. I at once secured his aid; rated him acting-gunner of the *America*, with assurance that he should be warranted full, regular gunner when the ship was manned; if, indeed, I could not succeed in obtaining a lieutenant's commission him. Mr. Gardner took entire charge of mounting the battery, including making of carriages, reeving of breechings and side-tackle, preparation of rammers, sponge-staves, quoins, handspikes, overhead tackle, shot-racks, and all the other almost numberless details of the battery of a line-of-battleship. He also took supervision of the internal fittings of the magazines, of which the *America* had two; besides attending to the racks for small arms—in short, everything pertaining to the armament of the ship. His services were invaluable, and much of the good condition of the *America* when finished was due to his skill and diligence . . . .

At last about September 1, 1782, the *America* was almost completed and some three hundred and eighty men (of whom about one hundred were survivors of the *Ranger* and *Bon Homme Richard*), had been enlisted for her crew. Of the officers, Richard Dale was to be her first lieutenant, and Edward Stack, Nathaniel Fanning, John Mayrant, and Elijah Hall, lieutenants. Everything seemed to point to a rapid completion and all already looked forward to an early commission and brilliant cruise, when again the Commodore's hopes were doomed to disappointment.

During the summer of 1782, the French 74-gun ship *Magnifique*, commanded by the Chevalier de Martigne and belonging to the Marquis de Vandreuil's fleet, was wrecked in Boston Harbor. The Continental Congress, in order to testify their gratitude for the French King's "generous exertions" in behalf of the United States, presented their only ship-of-the-line to Louis XVI.[1] But the ship was still on the ways, and Commodore Jones, upon the request of Robert Morris, continued his supervision of her construction until the day of her launch, which took place about five weeks later.

"The launching was a most serious problem," to quote from the Commodore's account, "as the ship was very large and heavy for the narrow water-way between the island and the main shore opposite the stern; so that the danger of her going on the opposite

[1] Papers of Continental Congress XXVIII, 233. Archives de la Marine B[4] 185, pp. 222-226.

shore with the sternway of launching could be overcome only by the difficult expedient of paying out and breaking hawsers in succession as she became water-borne in the stream. Three were snapped before the fourth brought her up at no more than barely safe distance from the opposite shore." But the Commodore's care and foresight were rewarded by a complete success, and the same day, Tuesday, November 5, 1782, he handed the ship over to the Chevalier de Martigne, who had commanded the lost *Magnifique*. The *America* was at once fitted out and commissioned by the French Admiral, and left Portsmouth, but on what date, I have been unable to ascertain.

Thus did the *America* pass out of the American Navy. Up to that time her history has been clear; what happened to her subsequently has up to now been a mystery.

According to one account [2] her name was changed by the King's order to *Le Franklin*, as there already was a ship named *l'Amerique* in the French Navy. But no other printed version or manuscript source, as far as I can ascertain, confirms this statement. The French ship-of-the-line *Franklin*, the finest two-decker of the time, carrying 80 guns, and built at Toulon, was not launched until the spring of 1797. She was captured by Lord Nelson's fleet at the battle of Aboukir, August 1, 1798, and taken into the British service, her name being changed to *Canopus*.

Cooper, in his Naval History, says that the *America*, commanded by Captain Louis Lhéritier, was captured by the British on June 1, 1794, in Lord Howe's engagement.[3] This appears to be an error, for the ship captured in that action was a new ship, launched only a short time previous, and one which is put down as "neuf" (i. e., not used, or building) in the French Naval List of March 23, 1793. She was therefore the rebuilt or remodelled American vessel, or a successor to the one presented eleven years before to the French King. The ship captured in Lord Howe's engagement was taken into the British Navy and renamed the *Impetueux*, there being already a 64-gun ship called the *America*, built in 1777, and subsequently burned in Portsmouth Harbor. James, in his Naval History, says that she was considered one of

[2] Buell: Paul Jones, II 82.

[3] Cooper: History of Navy of United States, London, 1839, I 285; Troude: Batailles Navales de France, II 338-395, 329; James: Naval History of Great Britain, I 172-174, 437.

the finest 74s that had ever been seen in a British port. There is a portrait of the *America*, as she appeared as a prize, in the *British Naval Chronicle*,[4] and another of the *Leviathan* engaging *L'Amerique* (America) in the action of June 1, 1794, the latter vessel being dismasted,[5] and still another picture.[6] According to an account in the *Naval Chronicle* her lower masts were four feet longer than those of a British 98-gun ship. The principal dimensions of the *America*, renamed *Impetueux*, were: Length on gun deck, 182 feet; length of keel, 149 feet, 8½ inches; breadth of beam, 48 feet, 7 inches; depth of hold, 20 feet, 6 inches; tonnage, 1884 tons; complement, 600 men; armament, 78 guns. The portraits of the vessel represent her with a stern gallery, whereas the *America*, built at Portsmouth, according to Commodore Jones, had none.

Preble, in his History of the Navy Yard at Portsmouth, says, on page 18: "The ship captured in Lord Howe's action was taken into the British Navy and renamed *Impetueux* . . . . and subsequently burned in Portsmouth Harbor;" and on the very next page: "In May, 1833, the *L'Amerique*, captured June 1, 1794, was, according to the British Navy List, in use as a store-ship at Bahia, Brazil." Evidently the good ship had the nine lives of a cat!

In 1799-1800 "an" *America*, commanded by Sir Edward Pellew (Lord Exmouth) is mentioned as "so much superior to the largest 74, that she was made a class by herself, and rated a 78."[7] She had been refitted and had the "crest of the Prince of Wales in the center of her beautiful stern."[8] Cooper considered this the same *America* that was presented to France.

Such are the different accounts that are to be found concerning our old *America*, and such her different careers and fates. But what really happened to her? Was her fate a glorious one, did she go down before the enemy's guns with her colors flying, was she captured by the British, did she become the prey of the sea, or was her's a peaceable end?

The reply to all these questions, now that it has been found,

[4] *Naval Chronicle*, Vol. I, p. 154.
[5] *Naval Chronicle*, Vol. II, p. 373.
[6] *Naval Chronicle*, Vol. XV.
[7] Life of Admiral Viscount Exmouth, Osler, 1854.
[8] *Naval Chronicle*, Vol. XV.

is simple, but it seems a pity that historians have for so long labored under false impressions upon this subject.

The *America*, after her departure from American waters, went to France, where she appears to have been in commission during the years of 1782 and 1783.[9] Nothing more do we hear of her until 1786 when we learn that she is rotting in the port of Brest, and unfit for sea service, and that Minister Castries has ordered her to be broken up, and another vessel, bearing the same name, and of the same rate, to be built. The two letters in which this information is revealed and whose existence up to now seems to have been unknown to American naval historians, are the following:[10]

20 August 1786.[11]

As a result of a careful examination which has just been made at Brest of the ship *America* given to Your Majesty by the United States, it has been found that this vessel, though built only four years ago, is entirely rotten, and that it is impossible to preserve her. Besides her repair would be less advantageous as she does not combine all the qualities which a vessel of her class should have. Therefore I have the honor to propose to Your Majesty to order her being broken up and to have another vessel of 74-guns built under the same name. BM.

18 August 1786.[12] BREST.

The letter for the King is dated the 20.

The examination of the ship *America* of 74 guns was made the 11th of this month with the greatest care. As the official report had to be submitted to the board it could not be sent the same day, but M. de la Porte Vezim says that this vessel, though built only four years ago, is entirely

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[9] Roles d'équipages, Archives de la Marine, Série C[6], 802.

[10] Archives de la Marine, Série B[1] 101, (92).

[11] 20 Août 1786.

Il resulte de la visite qui vient d'être faite à Brest avec beaucoup desoin du Vaisseau *l'America* donné à Votre Majesté, par les Etats Unis, que ce batiment, quoique construit depuis quatre ans seulement, est entièrement pourri, et qu'il n'est pas possible de le conserver. D'ailleurs sa refonte procureroit d'autant moins d'avantages qu'il ne réunit pas les qualités que doit avoir un vaisseau de ce rang. En conséquence, j'ai l'honneur de proposer à Votre Majesté d'en ordonner la démolition et de faire construire un autre vaisseau de 74, sous le même nom./. BM.

Archives de la Marine, Série B[1], 101, (92).

[12] 18 Août 1786. BREST.

La feuille pour le Roi est du 20.

La visite du V.'au *l'America* de 74 cannons a ête faite le 11, de ce mois avec le plus grand soin. Le procés verbal devant être mis sous les yeux du

rotten, and that it is impossible to preserve her. He adds that each part is equally rotten everywhere in the vessel, which, however, seems to have been completed with the greatest care.

This evidently proves that the wood of North America cannot be of any use for (naval) construction and that the highest altitudes of the Continent are, perhaps, the only regions whence it can be drawn.

As it seems to be in My Lord's programme to replace vessels whenever they have to be condemned, he is begged to order the construction of a 74 which shall be named the *America*.

A copy shall be made for the Minister.[13]

Such was the fate of the American ship-of-the-line *America!* It was her successor, and not she, that fell into the hands of the British at Aboukir, into the hands of that enemy she had been built to combat and conquer.

Conseil n'a pu être envoyé le même jour, mais M. le Mis. de la Porte Vezim marque que ce batiment construit depuis 4. ans seulement, est entièrement pourri et qu'il n'est pas possible de le conserver. Il ajoute que chaque piece est également gatée dans les différentes parties du V.au, qui paroissent avoir été toutes finies avec le plus grand soin.

Cet évènement prouve évidemment que les bois de l'Amérique Septentrionale ne peuvent être d'aucune utilité pour la construction, et que les plus elevées du Continent sont peut-être les seules ou l'on puisse en tirer.

Comme il paroit dans les principes de Monseigneur de remplacer les Vaisseaux à mesure qu'on est dans le cas de les condamner, on le supplie d'ordonner la construction d'un de 74. qui sera appellé *l'America./.*

On fera une feuille pour le Mis.

(Archives de la Marine, Série B[1], 101, (93).

[13] Archives de la Marine, Série B[1] 101 (93).

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE FIGHT FOR THE INITIAL POSITION.

A STUDY IN NAVAL TACTICS.

Translated from the *Marine-Rundschau*, July, 1907, by LIEUT.-COMDR. H. F. BRYAN, U. S. Navy.

Since the catastrophe at Tsushima, technical literature has been devoted to questions of naval tactics in a specially thorough way; and the great interest shown in the subject is made evident by the fact that every new idea is immediately taken up by technical journals for lively discussion both at home and abroad. The question of speed takes the lead in these discussions on naval tactics; and, in the course of its discussion, seems to have assumed a more tangible form, but also seems to have been gradually exhausted.

No matter what may be the effective worth of purely deductive-mathematical derivations as they appear again and again in technical writings, they have, at all events, a certain value even if all those absolute hypotheses necessary to geometry are greatly modified in war on account of all kinds of unforeseen events, and if many ingeniously constructed mathematical proofs have to be abandoned. To such hypotheses belongs, for instance, the initial position which two fleets occupy before the beginning of a battle.

As a mathematician, the line officer draws two fleets at certain distances from each other, and parallel to each other; assigns them speeds differing more or less, and puts them into motion in accordance with the purpose of his geometrical investigation; but, as a practical tactitian, he knows that two fleets cannot be set up like chessmen, in order to attack each other at a given signal, but that the gunnery fight is preceded by a fight for position, a contest of tactical talents and efficiencies for the most favorable initial position. No one will deny that this initial position, which, under some circumstances might give an important tactical advantage to one of the two opponents, is playing a great rôle in modern naval

tactics which is governed by the working of the battery; there are experts who even say that the outcome of the battle depends on it alone.[1] "Good scouting, tactical training, and superiority in speed are the means which help the commander-in-chief to obtain a favorable initial position";—true, but how is this to be carried out practically? On the battlefield of the open sea, where both opponents have the equal advantage of tactically unbounded mobility, it is wrong to act on such ideas. It is easy to say: "Try to gain a leading position," but what does "leading" mean in naval tactics, if this conception can be paralyzed by a simple evolution on the part of the opponent? Under normal conditions, we must not assume that the first shot will immediately follow the mutual sighting of two fleets—and all the less, a decisive gun-fire. The distance at which a hostile fleet can be made out in its approximate formation and course is about twice as great as the range at which it is possible to take up an effective gun-fire. At Tsushima, where the conditions for seeing were not entirely favorable, about half an hour elapsed between the sighting of the main bodies by each other and opening fire; and it must also be borne in mind that the Russian fleet did not attempt a single one of the tactical maneuvers befitting the conditions, but even shortened the interval mentioned above by maintaining its course.

It has been maintained that Togo's favorable initial position across and ahead of the deep route of advance of the Russians was the chief cause of his victory. This view, however, cannot be sustained if we may accept the testimony of the Russian Captain Semenoff. On the contrary, Togo's tactics will be regarded in a remarkable and not at all favorable light if the movements of the opposing fleets took place approximately as this witness reports. According to him, Togo not only needlessly sacrificed his ideal initial position, but, by turning toward his opponent, put himself in a tactical position which would have been fatal to him if he had been opposed by a fleet better trained in gunnery and tactics.

The battle of Tsushima hardly contains the material for studying the importance of the initial position; first of all, because a real fight for such a position did not take place at all; secondly, because the disparity in tactical training of the two fleets could not justify general conclusions. Failing examples from war history, the mathematical method is the only one left; and, if it be

[1] Prize-essay, "Trafalgar and Tsushima," *Marine-Rundschau*, Jan., 1907.

admitted that geometrical considerations have a certain justification in the field of naval tactics, it may be further affirmed that they are not so much justified during the fight as when the guns have not yet spoken, and have not yet shattered purely tactical-geometrical investigations to fragments; namely, in the fight for initial position. We accomplish nothing if we content ourselves with determining that one initial position is favorable and another unfavorable; we get nowhere if we say: "This and that material and abstract method aid in reaching a favorable initial position." We must rather investigate whether, how, and under what circumstances it is possible to win an advantage over our opponent in battle by means of the initial position.

THE MEANING OF INITIAL POSITION.

Initial position is the relative position of two opposing forces with reference to power of concentration, wind, weather, and sun at the moment when it becomes possible to commence an effective gun-fire.

Therefore, it is not a question of relative position at sighting each other, but of that position which represents the result of the tactical considerations and movements up to the beginning of the actual fight, and from which the first blow should be given. The weather and lee-gauge no longer play the important rôle they did during the era of sailing fleets; and opinion is divided as to which of these is the more favorable in modern naval tactics. With reference to the position of the sun, there is no doubt. But by far the most important factor is power of concentration, to which all other factors must be subordinated, and eventually sacrificed if necessary. The contest for initial position is therefore synonymous with the contest for power of concentration.

POWER OF CONCENTRATION.

Although the idea is clear enough in itself, it nevertheless does not convey exactly enough what the tactician desires to express. The ability to concentrate his strength on one point does not exhaust the problem which the tactician has to solve, as the following investigation will show:

In Diagram 1, let the fleet *A*, located at the center, be one on which the fleets *B-H*, occupying various initial positions, want to concentrate their fire. It must be strongly emphasized that the

diagram is purely theoretical, and therefore represents situations which will probably never arise in practice. Its purpose is merely to show what kind of positions, in naval tactics, are to be considered favorable or unfavorable, and in what degree. There is purposely no attempt made at the precise meaning of "front" and "rear."

1. *B* fleet is equal to *A* fleet in power of concentration, also *B'* fleet, for no one of these three fleets is able to concentrate more fire on one point of the enemy than the enemy can return.

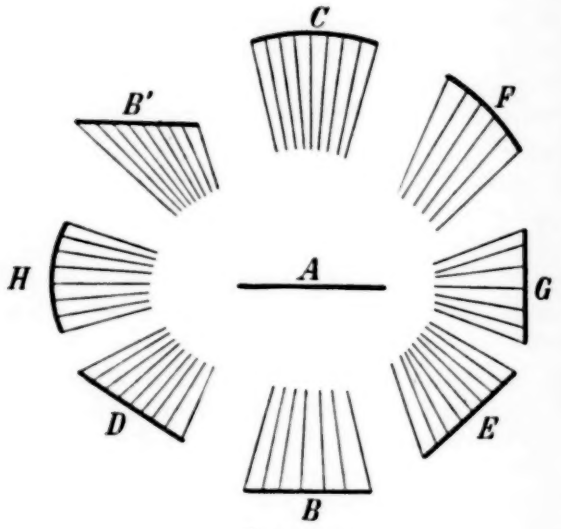

DIAGRAM 1.

2. *C* fleet is somewhat superior to A fleet, because the individual ships of her column—considered by themselves—are in full possession of their power of concentration (in contrast with the wing ships of *A* fleet).

3. *D* fleet cannot make use of her full power of concentration (the hostile head of column does not bear abeam of the middle of *D* fleet), but is superior to *A* fleet in this respect.

4. *E* fleet has an important superiority over *A* fleet (the last two-thirds of *A* fleet have too great a range, and besides, are limited by the *arc of train* of their guns; while *E* fleet, on the other hand, has full power of concentration against the nearest wing of *A* fleet).

5. *F* fleet is somewhat more superior in power of concentration to *A* fleet than *E* fleet is.

6. *G* fleet is raking *A* fleet with her entire fire, to which *A* fleet can only reply with a very limited fire.

7. *H* fleet represents the ideal position: she can bring not only the maximum of her power of concentration to bear on her raked enemy, but also robs him of target surface by drawing in her wing.

Therefore, it is not only one's own power of concentration (*B* and *C* fleets) which represents the ideal initial position, but the problem is only solved if, first of all, the enemy's power of concentration has been reduced to a minimum at the same time (*H* fleet). The intermediate positions approach the ideal position more or less. The ruling principle runs as follows:

Not to lose, under any circumstances, more power of concentration than the enemy is deprived of. The best way is to gain in power of concentration as the enemy loses.

THE APPROACH OF TWO FLEETS.

The manner of approach of two fleets depends principally on their strategical aims; here we have to distinguish between three different cases:

(a) One fleet tries to avoid a conflict and reach a place of refuge, while the other fleet tries to prevent this and force a fight.

(b) One fleet tries, before accepting battle, to combine with another, while the opposing fleet tries to prevent the union of the two forces, and to fight them in detail.

(c) Each of two hostile fleets seeks a decisive battle.

In cases (a) and (b), the approach is merely strategical; the strategical aim is the principal one; there can be no question of a fight for initial position in these cases until after the attainment of the strategical aim. But tactics comes strongly into play when a fleet is forced to recognize that its strategical aim cannot be attained, and that a fight can no longer be avoided; the strategical aim must then be abandoned; and the fight for initial position begins. Example of case (a): Tsushima, where Rojestvensky had to abandon his strategical aim on sighting the Japanese main body, at the very latest; and should have immediately commenced the fight for initial position; this, however, he failed to do. Example of case (b): Port Arthur on August 10, 1904, when the

Russian commander recognized the impossibility of attaining his strategical aim (junction with the Vladivostock cruisers) without a battle with Togo. At this moment, the fight for initial position should have begun. Here, again, it was not done. The case of (c) demands our special attention. Where both opponents have no other aim than to find each other and fight a decisive battle, where the whole spirit and thought of each is concentrated on obtaining the most favorable initial position by every available means, we have the necessary conditions for a simple and clear investigation of the question. By what laws is the fight for the initial position governed?

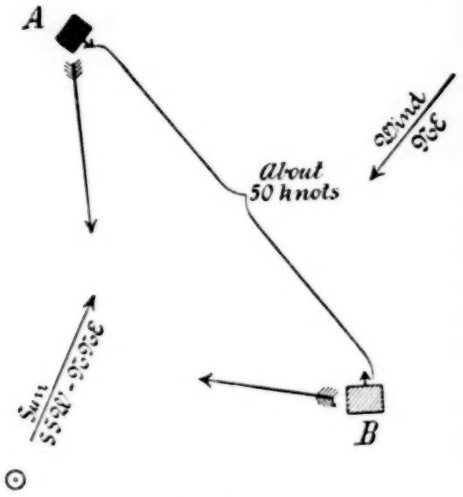

DIAGRAM 2.

STRATEGICAL AND TACTICAL SCOUTING.

Since wireless telegraphy attained such a predominating influence in carrying out strategical scouting, it is not as easy as it was to distinguish clearly between strategical and tactical scouting. Strategical scouting must furnish information about the position, course, and strength of the main body of the enemy; this information can be given if the distance between the two main bodies is fifty miles, or even more. Is it possible to begin the fight for initial position at this stage of operations? Certainly, if a fight for the weather or lee-gauge with reference to wind and sun is to be considered, it is thinkable and probable that it

will commence during the strategical scouting. This operation might be called the fight for the "bearing at sighting," for the bearing on which the enemy is finally sighted will generally approximately coincide with the principal line of fire.

In the above example (diagram 2), both fleets, *A* and *B*, will try to establish a reciprocal line of sighting each other running approximately NE.-SW.; and both *A* and *B* will try to get to the SW. side of this line. An approach of both fleets in the indicated direction will result from this effort. Speed and the accuracy of the information reported by the scouts concerning the position and course of both main bodies will naturally fix the course to be steered; and a mathematical investigation of the outcome would be futile. The fight for the "bearing at sighting" will soon enter a stage where regard to wind and sun must yield to the real fight for initial position, for power of concentration. During this period of transition, the moment will have to be sought at which strategical scouting ends and tactical scouting begins.

THE FORMATION OF THE FIGHTING LINE.

Whether column be the most favorable battle formation, or whether some other formation should be adopted, does not belong to this discussion. For our investigations, we must, at all events, accept the column, as it represents the simplest geometrical form, and can best be dealt with mathematically. A formation in several columns is best for the approach of a large fleet (about twelve ships or more) during the period of strategical scouting, because, in this way, the commander-in-chief keeps control of his ships for a longer time, and because the fighting line can readily be formed from such a formation. It is hard to lay down any fixed rule as to when the time for this has come. Handiness, supervision, and quick understanding of signals require the cruising formation to be maintained as long as possible; in addition to which, much time would be lost if a change of front became necessary after the fighting line had been established, and circumstances might make this maneuver complicated and difficult. On the other hand, anxiety about a possibly untimely establishment of the fighting line is relieved by performing this evolution somewhat too soon rather than too late. Generally, it can be accepted that the battle formation will be adopted before the two main

bodies sight each other, or, at the very latest, when they sight each other. If we accept this as the basis of our observations, the normal position of two fleets during the tactical approach will be represented by two keel lines, with more or less converging courses.

TACTICAL SCOUTING AT SEA.

Naval tactics, simple as they are in themselves on account of the uniformity of the battlefield, would be no art if their problems could be solved by dividers and rulers. It is one of the most difficult problems of practical naval tactics to do accurate scouting concerning the formation and course of an entirely visible but still far-distant column of ships. The stereoscopic power of vision of the human eye is very wide, for near objects, but, at distances of 6000, 7000, and 8000 meters and more, it cannot take in ships bodily. At such great distances, separate ships appear as silhouettes; a column of ships, a column of silhouettes. The difficulty cannot be overcome even when the eye is aided by glasses, because the field of vision decreases as the distinctness of separate objects increases; and a wide field of vision is necessary to tactical scouting. It is a matter of every-day occurrence that it is impossible to make out whether a distant column is making a course converging with, parallel to, or diverging from ours. It is also a well-known fact that column can hardly be distinguished from échelon at great distances; one has nothing to go by except the form in which the silhouettes of the ships appear. A ship appears to us in its whole length only when it presents its full broadside to us; this length, however, decreases with the cosine of the angle of obliquity; and, as the cosine of small angles changes very slowly, and only becomes ¾ at about three points, the result is that it is difficult to distinguish a formation in échelon (less than three points) from column. A long practical experience, no less than a trained eye, is necessary to insure accurate observation, and efficiency in tactical scouting.

THE FIGHT FOR POWER OF CONCENTRATION.

(a) *Establishing a Position Forward or Abaft the Beam.*

Two equally long columns, steering the same, or converging, courses, are in the same tactical position with reference to each other, if their heads of column are at the same distance from the

theoretical point of collision. The initial position, in this case, is reached as soon as the leading ships of both columns arrive at a range (say about 7000 meters) corresponding to good probability of hitting and effect. The thing to do is to have an advantage, a leading position, over the enemy on arriving at this initial position. If both fleets have the same speed, the distance of both heads of column from the theoretical point of collision will always remain the same. The result of the fight for initial position would be nil on both sides in such a case. This case is the simplest, and will seldom arise in practice, because, first of all, there will always be a certain difference in speed; and, secondly,—which is more important—neither of the two opponents will know who is the nearer to the theoretical point of collision at the beginning of the

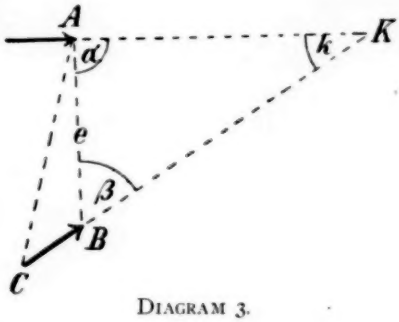

DIAGRAM 3.

fight for the initial position. It is evident, from diagram 3, that the distance of one's own (A) head of column and the hostile head (B) from the point of collision K can only be obtained by the trigonometrical solution of the triangle AKB, in which, however, only two parts (e and the angle α) are known. It is true that, theoretically, it is possible to solve the triangle AKB by means of the triangle ABC, but the sides AB and AC (distances of the hostile wing from one's own head of column) can only be known when range-finders give accurate results.

The bearing of the hostile head of column gives, in itself, no means of establishing which of the two columns possesses the leading position; but we can establish the relations which exist between the bearing and the angle included between both columns (diagram 4). The angle must be found by which the hostile head of column (A) ought to bear forward of the beam without one's own fleet (B) losing its leading position.

It is evident from the diagram that B fleet retains a leading position under all circumstances as long as its head of column lies between the two points D and K, that is, as long as the angle $KDA = 90°$, or is greater than $90°$. But the head of B fleet can only drop back the distance BD without losing a leading position, that is, the bearing of the head of column from A may be, at the most, the angle β forward of the beam. Now, the angle $\beta =$ the angle a, and the arc $AB =$ the arc BC. The angles a and k subtend equal arcs of the same circle, a at the circumference, and k at the center. Therefore, $a = \frac{1}{2}k$. In other words, if a fleet wants to make sure of a leading position, the angle by which its head has the enemy's head bearing forward of the beam must

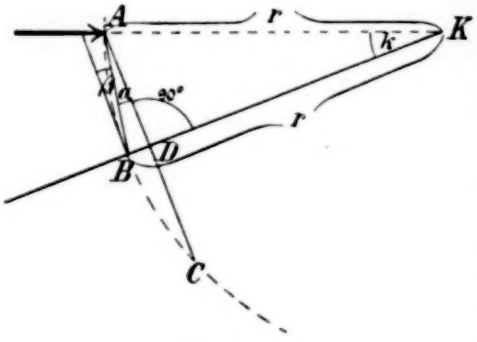

DIAGRAM 4.

not exceed one-half of the angle included between the prolonged courses of the two fleets. The following rule serves to apply this mathematical conclusion practically: If you have not a superiority in speed, estimate the angle between your own and the enemy's course too small rather than too large, divide it by two, and as a factor of safety, subtract a certain per cent more. The angle so obtained represents the maximum by which the enemy's head may bear forward of the beam.

(b) *Maintenance of an Obtained Leading Position.*

If a fleet thinks it has gained a leading position according to the preceding rules, at the beginning of the fight for initial position, the problem becomes: How maintain it? Let us suppose that the enemy does not undertake a tactical parry. A fleet in the conscious possession of a leading position would develop an in-

voluntary tendency to pass ahead of the enemy, in order to obtain, on opening fire, one of the positions *E*, *F*, *G*, or *H* (see diagram under "Power of Concentration"). This drawing ahead of

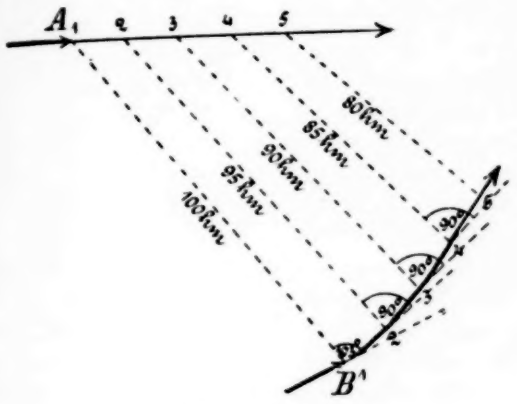

DIAGRAM 5.

one's own column will be accomplished by making and maintaining the bearing of the enemy's head at 90°. If in the beginning, this angle be greater than 90° it must be reduced to 90° by gradually turning toward the enemy, and then kept constant (diagram 5).

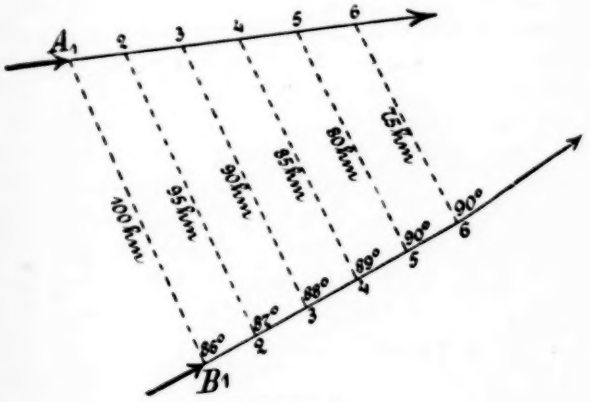

DIAGRAM 6.

If the angle be less than 90° at the beginning, it must be increased to 90° by maintaining the previous course, and then kept constant (diagram 6).

(c) *Speed.*

It is evident that speed plays an important part in the fight for initial position.

A leading position, obtained at the beginning, need not be lost on account of inferiority in speed.

First of all, it is very hard to establish, in the course of a fight for initial position, which of the two fleets is the faster. It is obviously an error for any one to suppose that he can make sure of the existence of a difference in speed because one of the two opponents changes its bearing one way or the other; or that he can draw the conclusion that the speed of both fleets is the same because the bearing remains constant. The last example (diagram 6) shows that, in spite of equal speeds, a continuous change of bearing takes place; and the following diagram, No. 7, shows that, for the assumed speeds of 12 knots (*A* fleet) and 10 knots (*B* fleet), the bearing remains the same for both opponents, and that *B*, in spite of inferiority in speed, wins the leading position on arriving at the initial position, and has greater power of concentration.

(d) *The Tactical Parry.*

The preceding deductions assume that the opposing fleet maintains its course. This gives rise to the necessary and proper objection that *A* fleet is not compelled to maintain its course.

We have already proved that a fleet is never in danger of being outmaneuvered in the fight for initial position as long as it keeps the enemy's head bearing abeam. It is incontestable that this is always possible, given enough sea room. Therefore, let us take *A* fleet abeam of the head of *B* fleet. What will be the result? (diagram 7). Both fleets will steer parallel courses abreast of each other; this does not, however, destroy our assumption that both fleets want to fight. Therefore, they must converge.

A tactical parry will be necessary—that is, against the leading position of the hostile fleet, and against the danger of inferiority in power of concentration on arrival at the initial position—as soon as it is determined with certainty that the enemy has a more leading position, and that he cannot be deprived of this advantage by holding on to the previous course. Naturally, the parry consists in turning away to leeward, whereupon a fight on the inner circle commences, while the other fleet loses its leading position,

and turns on the outer circle. The later tactical developments were recently discussed in articles in this publication; and are not within the scope of this article. The moment the inner column turns away may be viewed as the end of the fight for initial position, the fleet which turns away giving up the contest, as it were. To seize upon this moment correctly, and not let it slip, is the problem of the fleet in the more unfavorable position. The struggle for the more favorable position would not be so interesting and instructive as it is tactically if one could arrive at a recognition of his unfavorable position, and the necessity of a counter maneuver, by means of mathematical calculations; the

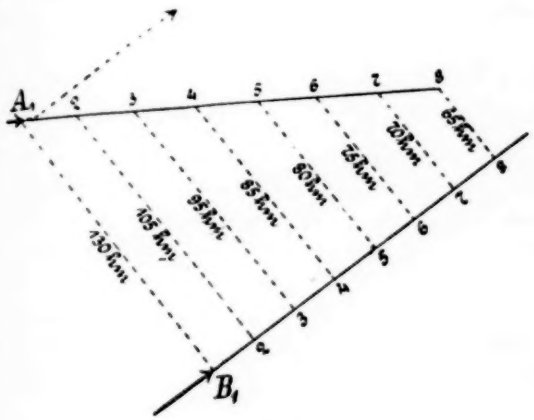

DIAGRAM 7.

fight for the initial position would then be reduced to the low level of mechanical, soulless work, while it is just the intellectual qualities that betoken tactical genius. The difficulty in the tactical ability to get information at sea is that it renders it impossible for the tactician to always determine whether he or his enemy is in the more unfavorable position; whether the chances are that he will win the more favorable initial position by holding on to his course, or whether he must turn. For an illustration of this, let us turn back to the last diagram, No. 7. The chief of *B* fleet has the enemy's head bearing abeam, and, in spite of the approach of both columns, this bearing does not change with reference to the course of *B* fleet. He can, therefore, be sure that he cannot be outmaneuvered if he holds on to this course. On the other

hand, the chief of *A* fleet has the head of *B* bearing somewhat forward of the beam, but is unable to conclude from this that *B* fleet has a more favorable position than *A* fleet, because he has no means of knowing how his own head will bear from *B*. Therefore, *B* has no cause to attempt a tactical counter maneuver, especially as, during the fight for the initial position, the bearing from *B's* head does not become more unfavorable, but remains constant. If, during the approach, the feeling be not aroused in *A* that he holds a tactically unfavorable position, but, on the contrary, *A* fleet holds its course to *A7*, he loses the fight for initial position, and cannot correct his error; in the effort to outmaneuver *B*, and acting on the wrong belief that he can do this by holding on to his course, he is himself defeated and outmaneuvered.

THE NUMERICAL VALUE OF TACTICAL POSITIONS.

It is very easy to see, from a tactical diagram, which of two fleets possesses the more favorable position; but it is very difficult to compare several tactical positions with each other, and determine which is the more favorable, and how much. It seems essential to find a method to get at the numerical value of a tactical position (with reference to the enemy), to fix upon a weight-number as it were, especially as this article will conclude with a short synopsis which will show to what different results the fight for initial position can lead under manifold assumptions.

The value of a position evidently depends only on the size of the angle of convergence of both courses, and on the angle by which the enemy's head bears forward or abaft the beam; and, generally, the value must increase directly as the former (β) increases and the latter (α) decreases (diagram 8). This gives us, first of all, the product $\sin \beta \cos \alpha$.

This formula needs a further addition, since:

1. The result will be nil if neither side has an advantage.

2. The result will be infinitely large or infinitely small, if one of the extreme cases arises.

3. The result will be negative if a favorable position becomes an unfavorable one.

The function tangent $(\beta - 2\alpha)$ satisfies these conditions. The formula, therefore, becomes $\sin \beta \cos \alpha \tan (\beta - 2\alpha)$.

In the following, the correctness of the formula will be tested:

How does the advantage of *A* fleet change with a change of assumption?

1. Angle β.

(a) β increases: therefore, sin β also increases, and *A's* advantage increases. 90° has the maximum sine, therefore *A's* advantage is greatest when the angle of convergence of the two courses is 90°.

(b) β decreases: sin β decreases, and *A's* advantage decreases. If β be zero, sin β is zero, and the product of the formula becomes zero; also *A's* advantage is entirely lost, as soon as the angle β becomes zero; and the courses will be parallel.

2. Angle α.

(a) Angle α increases: cos α decreases, *A's* advantage de-

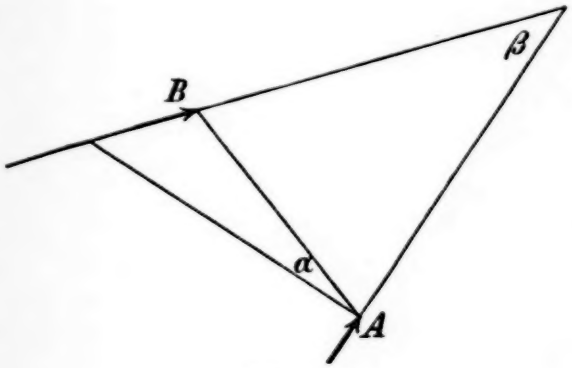

DIAGRAM 8.

creases directly as the angle α increases; and becomes zero as soon as α becomes 90°.

(b) Angle α decreases: cos α increases, *A's* advantage increases directly as α decreases, and reaches a maximum when α equals zero, that is when the hostile heads bear abeam from each other.

3. tan $(\beta - 2\alpha)$.

(a) The product sin β cos α, by changes in the angle α and β, evidently will be equally influenced by the factor tan $(\beta - 2\alpha)$, since tan $(\beta - 2\alpha)$ increases or decreases to the same extent with the increase or decrease of sin β and cos α.

(b) If $\beta = 90°$, and $\alpha = 0$, tan $(\beta - 2\alpha)$ = tan 90° = ∞, and the whole product of the formula becomes infinitely great. In this case, the ideal position (crossing the T) is reached.

(c) If $\beta = 2\alpha$, tan $(\beta - 2\alpha)$ = tan 0° = 0. The whole

product of the formula becomes zero; therefore, *A's* advantage is also zero (the case has been reached which was discussed under "Establishing a position forward or abaft the beam"; both heads of column are equally distant from the ideal point of collision).

(d) If $2a > \beta$, the angle becomes negative, the tangent is therefore negative, and the whole product of the formula negative; that is, the favorable position has become an unfavorable one.

If we admit, under normal conditions, that two fleets sight each other at from 13,000 to 15,000 meters, and that, during the approach to about 10,000 meters, the fight for the initial position has so far developed that the course and also the angle of convergence of both columns has been approximately determined, it is not difficult to ascertain, with the aid of assumed values of the angles a and β, in which initial positions both fleets will arrive on their previous courses, as soon as both heads have approached to about 7000 meters.

Example: Two fleets, A and B, in the course of a fight for the initial position, have arrived at such a position with relation to each other, distance 10,000 meters, that the prolonged courses include an angle of 30°, and in which A has the head of column of B bearing about one point forward of the beam. Both fleets have the same speed. At a distance of 7000 meters, how will the initial position of A compare with that of B?

1. A fleet: If the heads of column are 7000 meters from each other, the angle $a = 10°$ (easily proved graphically or trigonometrically).

$$\cos a \sin \beta \tan (\beta - 2a) = + 0.087$$

2. B fleet: For B fleet in the same position, $a = 20°$ (easily proved, as in the case of A).

$$\cos a \sin \beta \tan (\beta - 2a) = - 0.083$$

The result is negative on account of tan $(\beta - 2a)$; for $\beta = 30°$, and $2a = 2 \times 20° = 40°$. The difference is therefore negative $(-10°)$.

A fleet is therefore $0.087 + 0.083 = 0.17$ points more favorably situated as to initial position than B. The formula, therefore, permits all possible tactical situations to be evaluated numerically, and to be compared with each other. The practical worth of the formula need not be considered; it can be used, at all

events, as, for instance, in tactical war games, the aim of which is the fight for the initial position, and in which it is a question as to which fleet, and to what extent, has conquered its enemy in this tactical fight for position, in bringing both fleets to a decision on the basis of tactical maneuvers.

The following table shows the tactical relations existing between two fleets under different assumptions:

Angle of convergence.	The enemy's head of column bears forward of the beam: angle α									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	45°
0°	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5°	8 (−7)	−7 (8)	−24 (−)	−41 (−)	−59 (−)	−81 (−)	−112 (−)	−159 (−)	−258 (−)	−720 (−)
10°	31 (−30)	0 (0)	−30 (31)	−59 (−)	−93 (−)	−129 (−)	−178 (−)	−240 (−)	−360 (−)	−675 (−)
15°	69 (−67)	22 (−22)	−22 (22)	−67 (69)	−11 5 (−)	−164 (−)	−226 (−)	− 305 (−)	−430 (−)	−679 (−)
20°	124 (−117)	60 (−58)	0 (0)	−58 (60)	−117 (124)	−180 (−)	−249 (−)	−335 (−)	−453 (−)	−655 (−)
25°	197 (−178)	113 (−106)	37 (−46)	−46 (37)	−106 (113)	−178 (197)	−256 (−)	−344 (−)	−462 (−)	−632 (−)
30°	289 (−250)	181 (−165)	89 (−85)	0 (0)	−85 (89)	−165 (181)	−250 (289)	−344 (−)	−468 (−)	−606 (−)
35°	402 (−329)	266 (−232)	152 (− 139)	50 (−48)	−48 (50)	−139 (152)	−232 (266)	−329 (402)	−439 (−)	−572 (−)
40°	539 (−413)	389 (−303)	228 (−200)	112 (−104)	0 (0)	−104 (112)	−200 (228)	−303 (369)	−413 (539)	−538 (−)
45°	707 (−500)	493 (−379)	326 (−270)	183 (−165)	59 (−57)	−57 (59)	−165 (183)	−270 (326)	−379 (493)	−500 (707)
50°	913 (−584)	639 (−454)	442 (−342)	269 (−227)	130 (−121)	0 (0)	−121 (130)	−227 (269)	−342 (442)	−454 (639)
55°	1169 (−671)	816 (−527)	568 (−402)	376 (−296)	208 (−181)	66 (−64)	−64 (66)	−181 (208)	−296 (376)	−402 (568)
60°	1500 (−749)	1026 (−590)	623 (−468)	490 (−354)	295 (−241)	141 (−128)	0 (0)	−128 (141)	−241 (295)	−354 (490)
65°	1943 (−822)	1290 (−648)	891 (−513)	611 (−403)	400 (−296)	219 (−186)	70 (−66)	−66 (70)	−186 (219)	−296 (400)
70°	2583 (−883)	1620 (−688)	1116 (−564)	766 (−453)	493 (−348)	305 (−238)	147 (−130)	0 (0)	−130 (147)	−238 (305)
75°	3605 (−934)	2076 (−709)	1372 (−582)	941 (−483)	638 (−387)	410 (−292)	228 (−184)	72 (−67)	−67 (72)	−184 (228)
80°	5586 (−972)	2711 (−707)	1695 (−583)	1152 (−499)	781 (−412)	516 (−325)	310 (−228)	146 (−125)	0 (0)	−125 (146)
85°	11384 (−990)	3700 (−646)	2107 (−473)	1358 (−443)	910 (−421)	627 (−349)	400 (−259)	219 (−167)	68 (−63)	−63 (68)
90°	∞ (0)	5648 (−493)	2722 (−467)	1678 (−449)	1128 (−410)	756 (−353)	505 (−289)	295 (−205)	138 (−115)	0 (0)

EXPLANATION OF THE TABLE.

(a) In order to avoid decimals, resulting from the formula, all determined values are multiplied by 1000.

(b) The figures not in parentheses give the values for the fleet to which the angles α and β apply; those not in parentheses, values for the opposing fleet.

(c) With converging courses, a fleet will never reach such a position that its center will have the enemy's head bearing abaft the beam. This is necessarily so, for a fleet in such an advanced position would, at the proper time, have turned toward the enemy in order to maintain the enemy's head abeam—at all events, not to have it abaft the beam. Therefore, the table only gives angles α by which the enemy's head will bear forward of the beam. Where numbers are omitted from the parentheses, it means that impossible cases have arisen; therefore, values have not been calculated.

Example: During the fight for the initial position, a fleet gains a position in which the enemy's head of column bears 15° forward of the beam. Let the angle of convergence of the two columns be 55°. In power of concentration, it will have a tactical advantage of about +376 points; the enemy's fleet will be more unfavorably situated by about —296 points; that is, the difference amounts to $376 + 296 = 672$ points.

CONCLUSION.

The preceding essay represents an effort to clear up the idea of initial position, to investigate and test it, and to find out by what general points of view the fight for the favorable initial position will be carried out in large modern battleships. The motive of the essay lies in the fact that, though the idea of initial position has recently been much made use of in both native and foreign technical literature, it has never been analyzed in its details. The value of a favorable initial position in a modern naval battle is evident. In most tactical discussions, more and more importance is given to the necessity of a skilful tactician being sure of holding a leading position; but it has not yet been determined where the key lies to the correct tactical evolution. This key has not been found in the preceding essay; and cannot be found. Perhaps the moment of its arrival has been found, and the law formulated which may serve the practical naval tactician as a support for his thought and action in the fight for the favorable initial position.

Just as an equation with two unknown quantities cannot be solved if we only have a single equation as a hypothesis, in the fight for the initial position there are too few hypotheses available to permit the solution of the various unknown quantities. The science of mathematics here fails us; but it would be improper and ungrateful to therefore exclude mathematics from considerations of naval tactics. On the contrary, we cannot do without it at all, if we want to fix upon the fundamental elements of naval tactics, and guard against elementary errors.

The worth of mathematical investigations must not be estimated too high; for in the last resort, practical ability is the ruling factor. Without knowledge, however, ability is not conceivable; and this knowledge cannot be better obtained than by a theoretical investigation of the concrete case, and by logical conclusions about the real.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SEUMANUTAFA AND FA'ATULIA.

Letter from WILLIAM CHURCHILL, formerly United States Consul-General to Samoa, presenting to the Naval Academy photographs of Samoan heroes.

NEW YORK, April 8, 1908.

Lieutenant-Commander E. L. Beach, U. S. N., Annapolis.

MY DEAR BEACH: If it be at all worth the while to bear a brave deed in mind, if there is to remain to the navy of the United States the recollection of one debt which it must ever owe and which, under the President's own hand, it has acknowledged, surely there must be some spot in the great hall of memory at the Naval Academy in which to niche these autographed photographs of Seumanutafa, chief of Apia, and of Fa'atulia, his wife, brave man, noble woman.

Official reports have recorded the deeds of Seumanutafa and his lifelong and unswerving friendship for America. Yet it will not come amiss to recite once more the crowning fact that when our sailor lads were battling for life in Apia Harbor a man there was upon the beach who was all man.

That dark March day of 1889 the rains descended and the floods came. The rain came down in blocks, the Vaisigano stream was booming in spate from the downpour on the Upolu mountains steeply rising behind Apia and was discharging all its fury upon one arm of the little harbor, where it met and warred with the swirl of the whole Pacific Ocean driven through the harbor mouth and to that very spot under the tempest blast of hurricane. The *Nipsic* had finished her wonder feat of scrambling, crawling, crashing over the reef's coral hedge, and lay crippled but snugly berthed in the sands just south of Matautu. The *Vandalia's* last cruise was done and she lay torn and bleeding, a wreck, a little

south of the *Nipsic*. When her sail of men had proved ineffective the *Trenton* came fighting along to that one point where fiercely boiled that caldron of the water of the angry sea and the water of the burdened hills, the mouth of that Vaisigano, the "river of fragrant blossoms," where most times women laugh and chatter at their task of washing clothes in its warm and sluggish shallows.

Hope for the ship there was none, for her company there seemed less.

Out into that hell of waters one man inched his way, one hand holding out a hero clutch over that dark turmoil and that the stronger hand, the left behind him in the firm brown clasp of a trusty tribesman. Barefooted he won a footing on the jagged coral—as well might one elect to tread on broken bottles—and in that millrace set his form against the send of the mighty sea. Into the tumult followed upon his chief the second man, one hand holding his leader, one hand grasping both to sure hand-clasp upon the shore. Brave man by brave man this chain linked out from the beach, each bare foot taloning the jagged reef, each breast, in man's triumph over Nature the brute, buffeting back the waters. Link by link, and every link a man, these Samoans paid out the line of their generously jeoparded lives, the lifeline for the *Trenton,* until their leader was barely holding his own, his head awash. Yet his one free hand—with one hand he held to life, with one he grappled death, the death brooding over American sailors—his one free hand was ever reaching blindly into the dark and deadly turmoil and what he seized he held, a *Trenton* man snatched from death, and passed him back along the line from one mighty arm to the next and so to shore, so back to life. How many were saved by his untiring clutch no man ever knew, himself least of all, for in that theater of heroism none stood by to tally. But ever at the head of the line of life, ever playing a man's part, that man of men was Seumanutafa.

As fast as each man was brought to shore he was hurried to the chief's house, there to pass under the ministrations of Fa'atulia, who worked untiringly and directed her handmaidens in completing the rescue.

When I think upon that bitter day and its unshattered courage in disaster afloat met by such unshrinking bravery of our Samoan friends ashore, when I recall how many of us have gone already to their last account who knew Seumanutafa, even as the

hero chief has passed where went Kimberly and Dick Leary before him, even as all of us must leave a brave world which honors its brave, then I feel sure that somewhere near the *Vandalia's* historic flag which I have already sent to the Academy there will be found a little space for two who proved to our old navy that they were friends both in the need and in the deed.

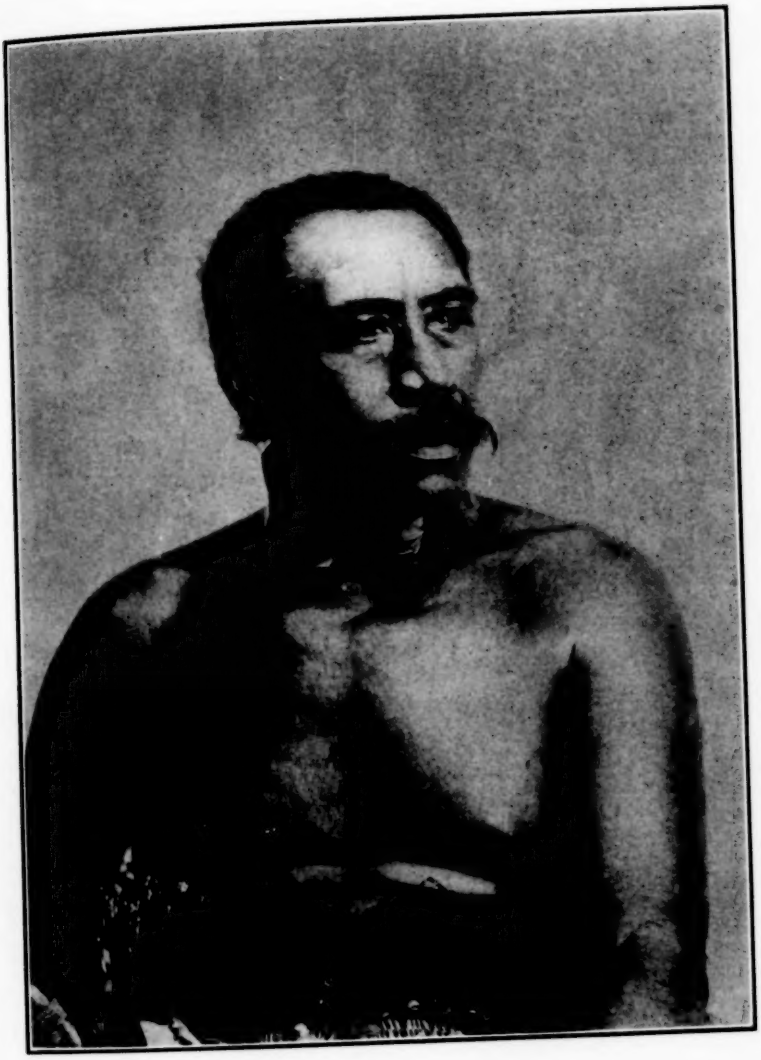
And when the tropic sky smiled once again upon that charnel port of dead ships, kissed warmly the scores of new graves upon the shore, when relief came and Admiral Kimberly sailed away from the warm heart of Samoa, then some unnamed bard of Seumanutafa's household poured out his soul in the "Farewell to the Admiral." One verse, the burden of the whole poem, I here set down with a bald rendering into English:

Tofā, mai feleni,	Good-by, my friend,
O le ā o'u tea;	I now must lose thee;
'A e folau le va'a	For the ship is going away
O le ali'i pule Ameleka.	With the Admiral of America.
Ne'i galo mai Apia	Never forget Apia,
Si o ta 'ele'ele,	Loved place of my abode,
'A e manatua mai pea	Still cherish her in heart,
Le 'aupasēsē.	Ye men of the sea.

A generation has sped, songs have come and gone, but this remains the one song that all Samoans always know how to sing.

With warm regard for the Academy, with a fond recollection of Seumanutafa,

WILLIAM CHURCHILL.



Semanentapa

Hattie

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE STRATEGIC IMPORTANCE OF THE NAVAL BASE AT KEY WEST, AND ITS STRATEGIC LINES OF FORCE.

By COMMODORE W. H. BEEHLER, U. S. Navy.

The principles of strategy are the same for all ages, independent of the changes in tactics that are introduced by the changes in weapons, and a commanding site on the highways of commerce must always be of great strategic value. No change in armament or methods of warfare can ever affect the strategic importance of such a site as that of Key West.

The departure of the fleet of battleships to the Pacific calls attention to what remains immediately available for the naval defence of the Atlantic. It is true that no war is immediately expected, but in these days events are often precipitate and it is the duty of the government to be prepared for immediate action when necessary.

The construction of the Panama Canal, the American protectorate over Cuba, the Monroe Doctrine, and our influence in the Central American governments, require the backing of an adequate naval force, and as Key West is nearer, by several hundred miles, to this sphere of influence than any other port in the United States, it appears at once to be the salient position from which these political considerations can best be controlled.

A brief study of the chart will convince any one of the commanding position of Key West. With a radius of one thousand miles, Key West (the gate of the gulf) is the center of a circle that passes through Washington, San Juan, Port Rico, and Panama. The wireless telegraph station at Key West is in direct communication with the stations at Washington, San Juan, Guantanamo, and Colon, besides being in communication with other wireless stations nearer to Key West along the Atlantic coast.

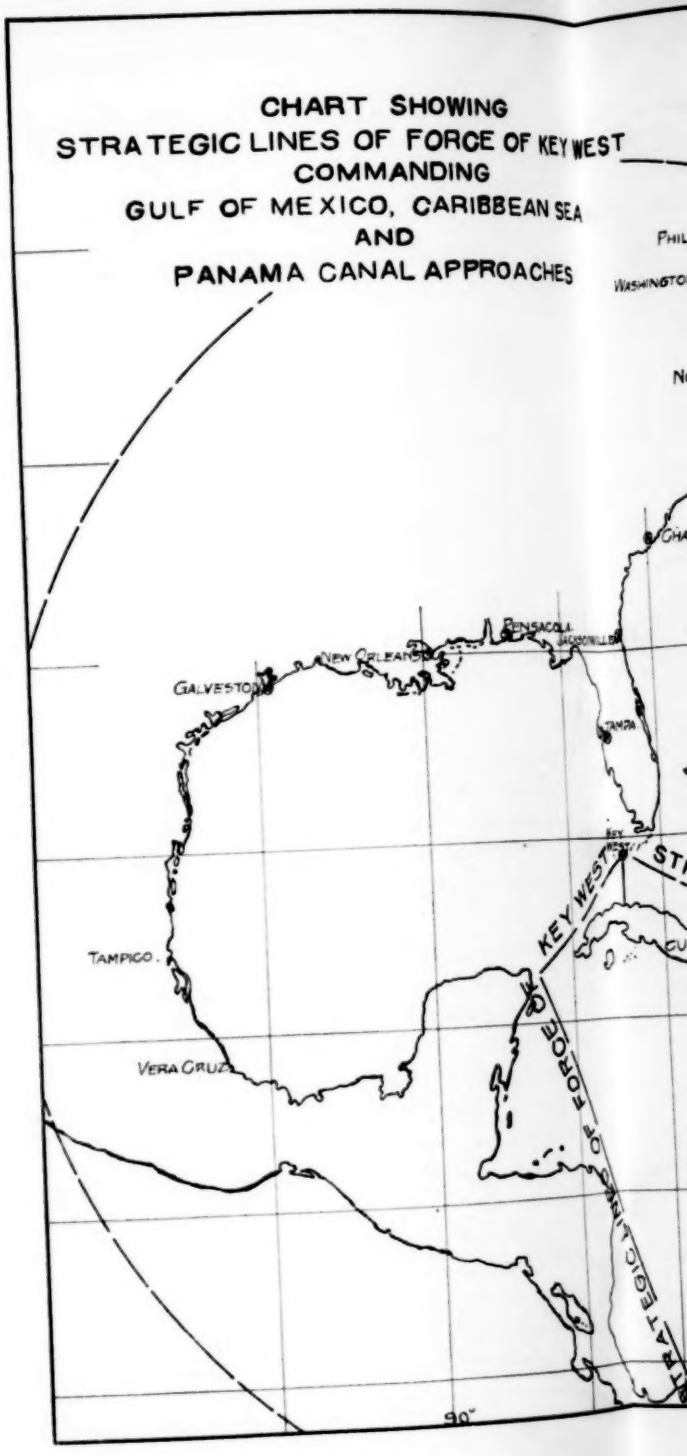
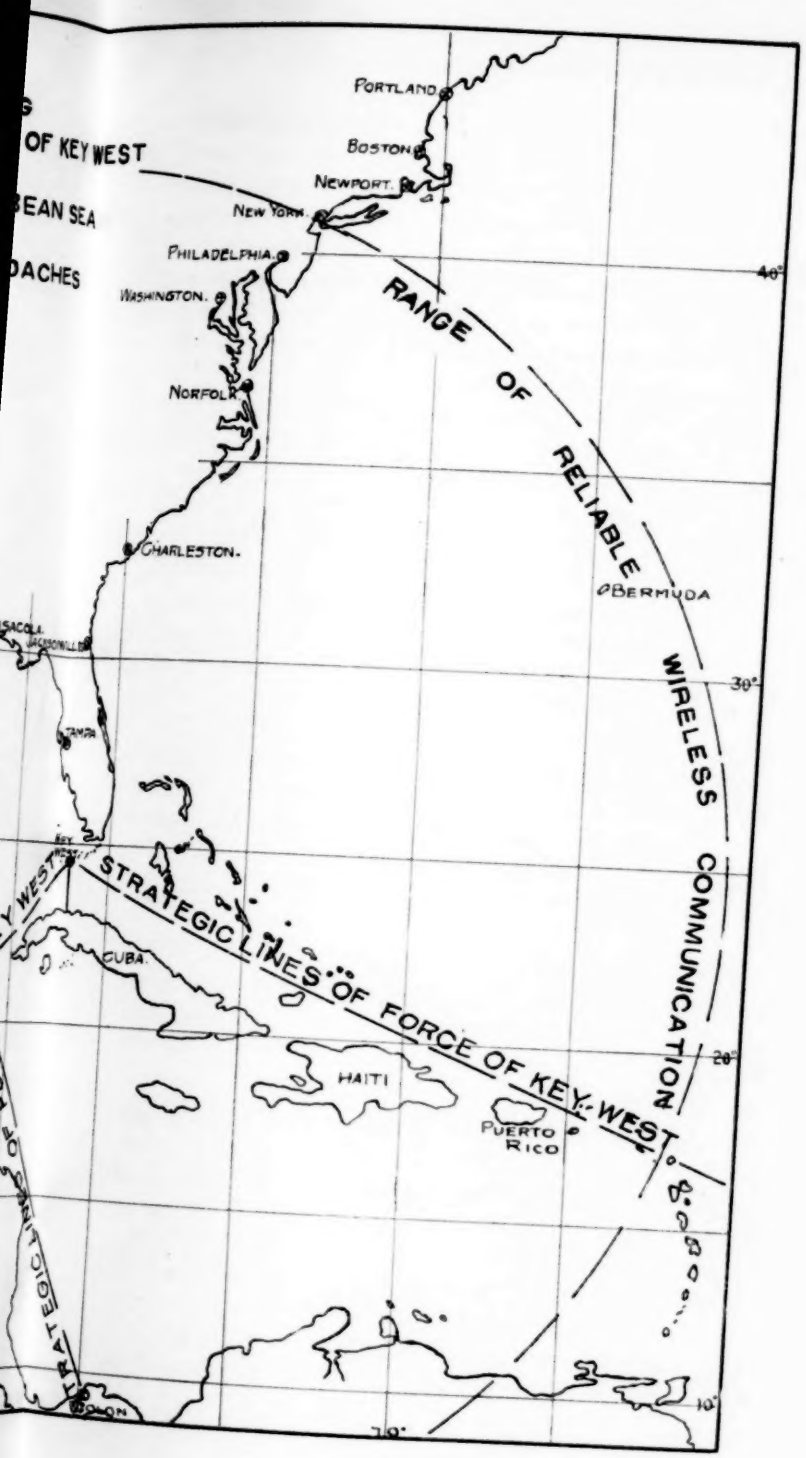


CHART SHOWING
STRATEGIC LINES OF FORCE OF KEY WEST
COMMANDING
GULF OF MEXICO, CARIBBEAN SEA
AND
PANAMA CANAL APPROACHES
PENSACOLA
JACKSONVILLE
NEW ORLEANS
GALVESTON
TAMPA
KEY WEST
TAMPICO
VERA CRUZ
KEY WEST FORCE
STRATEGIC LINE OF PANAMA FORCE
90°


OF KEY WEST
EAN SEA
DACHES
PORTLAND
BOSTON
NEWPORT
NEW YORK
PHILADELPHIA
WASHINGTON
NORFOLK
CHARLESTON
RANGE OF RELIABLE WIRELESS COMMUNICATION
BERMUDA
40°
39°
28°
10°
79°
STRATEGIC LINES OF FORCE OF KEY WEST
CUBA
HAITI
PUERTO RICO

The strategic lines of force drawn on the chart are self-explanatory. In the war with Spain the writer was in the *Montgomery* when Sampson started from Key West on this strategic line of force to search for Cervera. Sampson went to Porto Rico, bombarded San Juan, sent the *Montgomery* to St. Thomas, cruised on that strategic line of force, and was joined there, near Crooked Island Pass, by the *Oregon*, so that the enemy in the Caribbean could not pass north to menace the United States Atlantic ports without encountering Sampson's fleet.

These strategic lines of force completely command all approaches to the Panama Canal, and effectually blockade the Caribbean and the Gulf of Mexico at Key West.

The strategic value of Key West or any point on the extremity of the western end of the Florida Keys, was recognized long before the Civil War. In fact, during the first part of the last century, when the West Indian Islands, by their production of sugar and tobacco became one of the richest marts in the world, the political control of the West Indies and Caribbean was one of the chief problems of the maritime nations. Our statesmen were not ignorant of these conditions. They have left indisputable evidence of their appreciation of the strategic importance of the control of the Straits of Florida. Fort Jefferson, on Dry Tortugas, is a wonderful monument to the strategic importance of this region. An immense brick structure, now useless as a fort, occupies the most salient point at the western end of the Straits of Florida.

Dry Tortugas is only sixty miles west of Key West, and is thus near enough to be practically a part of Key West in all strategic considerations, especially for a naval base for operations of flotillas of torpedo craft, which, at twenty knots, make the trip in about three hours.

Dry Tortugas was garrisoned for many years, during and after the Civil War, and is chiefly known to the American people as the prison of Dr. Mudd, who was charged with complicity in the conspiracy that assassinated the martyred president, Abraham Lincoln. In his profession, as a doctor, he had treated Wilkes Booth for his sprained ankle, after he had assassinated the president. It was also the prison of Dr. Cunningham, who was convicted of the horrible intent of infecting the city of Chicago with an epidemic of yellow fever, by means of trunks of clothing from

those who had died of yellow fever. We now know that it is impossible to transmit yellow fever, except by the hypodermic action of mosquitoes, who take the germs from one sick with the fever to one who is not immune.

Shortly after the outbreak of the war with Spain, Dry Tortugas was transferred to the navy for a coaling depot. A garrison of marines took possession in 1901, and two piers, with coal sheds, and a distilling plant were erected on the key outside the Fort. These two sheds were completed in April, 1904, at a cost of $590,000. They each have a maximum capacity of about nine thousand tons of coal. The channel to these coal sheds and their magnificent steel piers, is thirty feet deep. These sheds and piers are in excellent condition. The distilling plant was also completed and was in excellent condition when it was decided to send it to Guantanamo. Last year this distilling plant and its house was dismantled, loaded on three coal barges, and towed to Guantanamo, where it has since been erected.

There are a number of large cisterns at Dry Tortugas, and every casemate in the old Fort Jefferson has a cistern, so that there is always in the neighborhood of three hundred thousand gallons of water. The rain fall there is more than ample to supply water for all of the ships that could visit this coaling station. The distilling plant was never found to be necessary.

A little over a year ago it was contemplated to transfer Tortugas to the Public Health and Marine Hospital Service, for a national quarantine station, especially for yellow fever patients. This contemplated transfer has not been effected, and it is stated that the Public Health and Marine Hospital Service is not disposed to take Dry Tortugas for that purpose.

The coal that was stored at Dry Tortugas was removed, and no further work is being done there, except to keep the coal-hoisting machinery in order. The machinery is in excellent condition, and in fact the entire coal plant, the piers and sheds, and everything is in fine order, and can be rehabilitated at short notice.

The yellow fever scourge is not at all dreaded at Key West. It has never originated there, and with a strict quarantine, it can readily be kept out. In fact it can only be transmitted by stegomyia mosquito, and it is therefore easily kept under control.

Four years ago the commandant of the naval station at Key West was instructed that, in case of yellow fever, the non-im-

munes, including the officers and men of the navy, were to abandon Key West, and go north. This plan of fleeing with refugees from the yellow fever is very objectionable. The refugees carry the fever and the mosquitoes with them. They are thus much more exposed to catching the fever than others. They are unwelcome wherever they may go, and they are subjected to great discomfort and expense in their efforts to escape from a yellow fever epidemic. The present instructions are that non-immunes shall be sent immediately to Dry Tortugas, where the commandant could readily enforce a strict quarantine. Any yellow fever patient could be immediately isolated on the neighboring keys, at Loggerhead or Bird Key, and thus insure immunity for all non-immunes of the navy who may have taken refuge at Dry Tortugas. But the dread of yellow fever no longer exists at Key West and all idea of any objection to Key West on account of yellow fever can be ignored.

The sanitary condition of Key West is very good. The climate is superb, but the city has no sewers, and the Cuban population, of cigar makers, have very little interest in the sanitary regulations of the city. When the city shall have been modernized, streets paved, sewers laid, etc., it will be an ideal sanitarium.

The daily temperature is equable, the extreme range of the thermometer is only ten degrees in summer. The weather bulletins show that in summer the maximum temperature at Key West is less than that of any other city in the country, while in winter, the maximum temperature is higher than that of any other place in the country. In summer, the daily range of the thermometer is from 85 to 95, or from 80 to 90. In summer it rarely goes below 80 degrees, or above 95. In winter the daily range is from 60 to 70. It rarely goes below 50, and seldom above 85.

The other meteorological conditions at Key West, in regard to winds and storms, are exceedingly favorable. The N. E. trades prevail as a rule, but frequently vary. The centers of tropical cyclones rarely approach within a hundred miles of Key West. The island of Cuba forms a veritable wind-break, so that storms generated in the Caribbean or to the eastward, pass west, south of Cuba, and through the Yucatan Channel, across the Gulf of Mexico, and strike the coast at Pensacola or Galveston and other points along the north shore of the gulf. Or these tropical

cyclones will pass to the eastward of Cuba, and strike the coast of Florida between Jupiter and Jacksonville, or the Atlantic coast further north, following the general direction of the Gulf Stream. In either case the storm's track is either east or west of Key West. Key West is thus shielded from the tropical storms that do so much damage along our Atlantic coast and at Pensacola and Galveston. Fresh winds frequently prevail, but are rarely of dangerous force. There is never any fog, and bright, sunshiny weather often prevails uninterruptedly for a week, or even ten days. A prolonged period of more than two days of bad, rainy weather is almost unknown in Key West. During the rainy season, there will be frequent very heavy thunder showers, when it pours, but rarely any long-continued rainy spell.

Outdoor work is therefore very seldom interrupted for more than a brief period by weather conditions, so that during the entire year, nautical work in the harbor can be carried on uninterruptedly.

Key West was very much needed as a naval base, during the war with Spain, and it was found inadequate chiefly on account of the lack of fresh water. Key West depends upon the rainfall entirely for its supply of fresh water. There is no public reservoir of water in the city. Every house has its cistern, wherein water is collected from the roofs. There was a very careful investigation of the possibility of boring an artesian well. In one of the bulletins of the Geological Survey, Vicksburg limestone has been reported to have been found underlying the island of Key West. This limestone is a water-bearing rock, and it was assumed that pockets of fresh water would be found by drilling artesian wells. There were a number of prominent advocates of these artesian wells, but a thorough examination of the conditions showed that it would be impossible for any artesian well to be found under the island of Key West.

Any such pocket of fresh water would have to be supplied with fresh water from the mainland of Florida, a distance of 150 miles from the nearest elevated point, and that watershed would be only fifty feet above the sea-level.

Water from such a distance could not possibly have sufficient head to rise to the surface through an artesian well. It is impossible to expect any fresh water from the mountains of Cuba, on the other side of the Straits of Florida, as the depth of the water in

the straits is about 500 fathoms, and fresh water could not flow across under the Straits of Florida.

The railroad intends to solve this problem by an aqueduct, to be built along the railroad, which will bring fresh water from the artesian wells on the mainland. This would be a very expensive arrangement and doubtful of success. The solution of the water problem lies in building large cisterns for the storage of the immense quantity of rain water which could be collected and it would be sufficient for all demands.

On the naval station two large cisterns and an elevated tank have recently been built, so that the present storage capacity for fresh water amounts to 800,000 gallons. One elevated tank and a large cistern, with a total capacity of 400,000 gallons are now being removed from Dry Tortugas, and are being erected on the naval station. This will increase the storage capacity to 1,200,000 gallons. Estimates for a 700,000 gallon cistern have been submitted and recommended by the chief of the Bureau of Equipment, for rain water to be issued to ships. This cistern will be located convenient to the water front, near the distilling plant.

The present distilling plant must eventually be enlarged. It has now a capacity of 10,000 gallons per day. As the new buildings contemplated, together with those already authorized, will increase the surface for the collection of rain water, additional cisterns can also be built, by which, eventually, the storage capacity at this station will be increased by another million gallons. These reservoirs of rain water, with enlarged distilling plant for reserve, will thus fully meet all the demands for fresh water, and this objection to Key West, as a naval base, will no longer obtain.

COMMUNICATIONS.

Key West has been one of the most isolated points in our country. The Mallory Steamship Line, and the mail steamers from Tampa and Miami have been the only means of communication, and in the war with Spain the problem of supplying Key West with adequate stores of provisions for the army and navy, was very difficult and resulted in the army using Tampa as a base, rather than Key West. This lack of communication has seriously impaired the use of Key West as a naval base, in the past, but this objection is removed by the construction of the Florida East Coast R. R. Extension, to Key West. This exten-

sion was to have been completed a year ago, but owing to financial difficulties, Mr. H. M. Flagler, who has been financing the construction of this railroad along the keys had to discontinue this work. It has now been resumed, and the road is in operation as far as Knight's Key, about thirty-five miles east of Key West. The embankment, connecting a number of the smaller keys, such as Stock Island with Key West and other points, has been completed.

The construction of this railroad is one of the greatest achievements of the age, and its completion and operation will undoubtedly greatly enhance the strategic value of Key West. It will place the entire resources of the country available at Key West, and all objection to Key West on account of its isolation and lack of communication will be overcome.

The construction of the railroad, by filling between the keys, has had a marked effect upon the currents and tides. These currents that passed in between the reefs and Keys, north and south, are now diverted, to a large extent, around into the harbor of Key West. The tides all come from the Atlantic and flow close in to the outer line of reefs, into the channels between the outer reefs and the keys, and finally into the Gulf of Mexico.

The chart shows the route of the extension of the Florida East Coast Railway from Miami on the mainland, down to Key Largo which is joined by a narrow isthmus, thus along the keys to Knight's Key, opposite Sombrero Light. Here there is an immense concrete, arched viaduct 10,000 feet long, still in course of construction.

There is a line of reefs from six to seven miles outside the line of keys, and between them there is a navigable channel for light-draft vessels, and especially for torpedo-boats. It has been claimed that this railroad is much exposed to be cut by a landing force from cruisers. There are but few places where cruisers could navigate inside of the reef, and then only for a very short distance. A flotilla of torpedo-boats could readily command the inner waterway, and give adequate protection to this railroad. The protection afforded by the outer reefs, seven miles to seaward from the railroad, is in itself, a better protection than that which many other coast railroads have.

The navy is, after all, the best coast defence, operating sufficiently far away from the beach, so that property on shore is not exposed to danger.

ROUTE OF RAILROAD ON FLORIDA KEYS

The development of this place will necessarily compel the erection of fortifications along the outer reef. The defences of Key West are adequate for its harbor, but do not prevent an enemy from anchoring just outside of Sand Key, and the outer line of reefs. Preliminaries have already been started for this purpose, and when the strategic value of Key West is fully realized, the railroad line of communication will be provided with ample protection.

Incidentally, the railroad with its telegraph lines, will solve all the problems of the Navy Coast Patrol, in transmitting intelligence, and facilitating the operations of torpedo-boats, and the navy forces to command the Straits of Florida.

Knight's Key has a good deep channel, for large vessels, but a very small harbor. This will be a secondary base, depending upon the naval base at Key West.

There are two cables to Havana and to the mainland, by which Key West is in telegraphic communication with the rest of the world. The wireless at Key West has been demonstrated to be thoroughly reliable, at least for a few hours every day, and such progress is being made in the art, that it is believed that the present difficulties with static will eventually be entirely overcome.

Key West is the terminus of the Atlantic Coast Inland Waterways. Mr. G. F. Miles, Managing Director of the Florida Coast Line Canal & Transportation Co, is strenuously pushing the canal construction between Jacksonville and Miami. Col. R. M. Thompson's houseboat *Everglades* made the trip partly through the canal to Key West. Now it is claimed 7 feet can be carried, and the canal will eventually have not less than 9 feet, to permit navigation by torpedo boats and freighted canal boats *via* the inland waterways and canals from Norfolk to the strategic base at Key West.

The construction of the railroad to Key West, therefore, removes the last great objection to it as a naval base. And it remains only to consider its harbor, the channels, and facilities the place affords.

KEY WEST HARBOR.

The harbor of Key West is a magnificent sheet of water, about five fathoms deep, having a large number of small shoals, loggerheads, etc. With the exception of some dredging in the north-

west channel, for the convenience of the Peninsular & Occidental S. S. Co. mail steamers, there has never been any money expended for the improvement of this harbor.

In 1903-04, the late Rear-Admiral Belknap, with Captain (now Rear-Admiral Bicknell) made a very elaborate study of Key West Harbor. His plan contemplated the deepening of the channels to not less than thirty feet, and to have large basins, to be protected by bulkheads, one in the west channel to be five miles long and one and one-half miles wide, in which the battle fleet might anchor.

The estimates for this work were based upon the excavating of so-called coral rock, at two dollars per yard. One of the contractors for the Florida East Coast R. R. Co., claims this can be done for about thirty cents per yard, with the new hydraulic dredges, since the rock is soft, that it can readily be handled by these dredges. This contractor, Mr. Trumbo, built up the terminus for the railroad. This terminus occupies an area of 1600 feet long and 900 feet wide, and is situated north of the island, with its western end facing on the edge of the thirty-foot channel, in Man-of-War Harbor, and runs up to near Fleming Key, as shown on the chart of the harbor of Key West. On this island, reclaimed by dredging from the sea, the railroad will erect its terminal station, and ultimately, intend to have twelve piers to accommodate vessels loading at the terminal. These vessels will have a channel thirty feet deep to the sea entrance.

Trumbo Island (this terminus of the Florida East Coast R. R. Co.) has been practically completed. It was for a long time a question as to where on the island of Key West this terminus was to be built, but Mr. Flagler claims that he can make land, as he has done in the case of Trumbo Island, cheaper than he can buy it.

In getting the dredged material for building up Trumbo Island, the dredges took up all of the loose mud, down to bed-rock immediately north of the island of Key West, and finally requiring more, they crossed over and began dredging the mud from the shoals adjacent to Fleming Key.

Upon investigating the title of the navy to Fleming Key, it was found that in 1855, Fleming Key and its adjacent shoals and Man-of-War Harbor, were all reserved by the United States government for a naval depot. This key is simply a submerged

rock that comes up to within two feet of the surface, and is covered with a growth of mangrove bushes, and is of irregular form. In the summer of 1905 it was thoroughly examined, and it was found that an area of about sixty acres could readily be reclaimed by building a retaining wall around it. Basins for torpedo-boats could readily be dredged out, and the dredging used to fill the key to about eight and one-half feet above the sea-level. The mud on the shoals between the western side of the key and Man-of-War Harbor, a distance of about 300 feet could also be used to fill in the key.

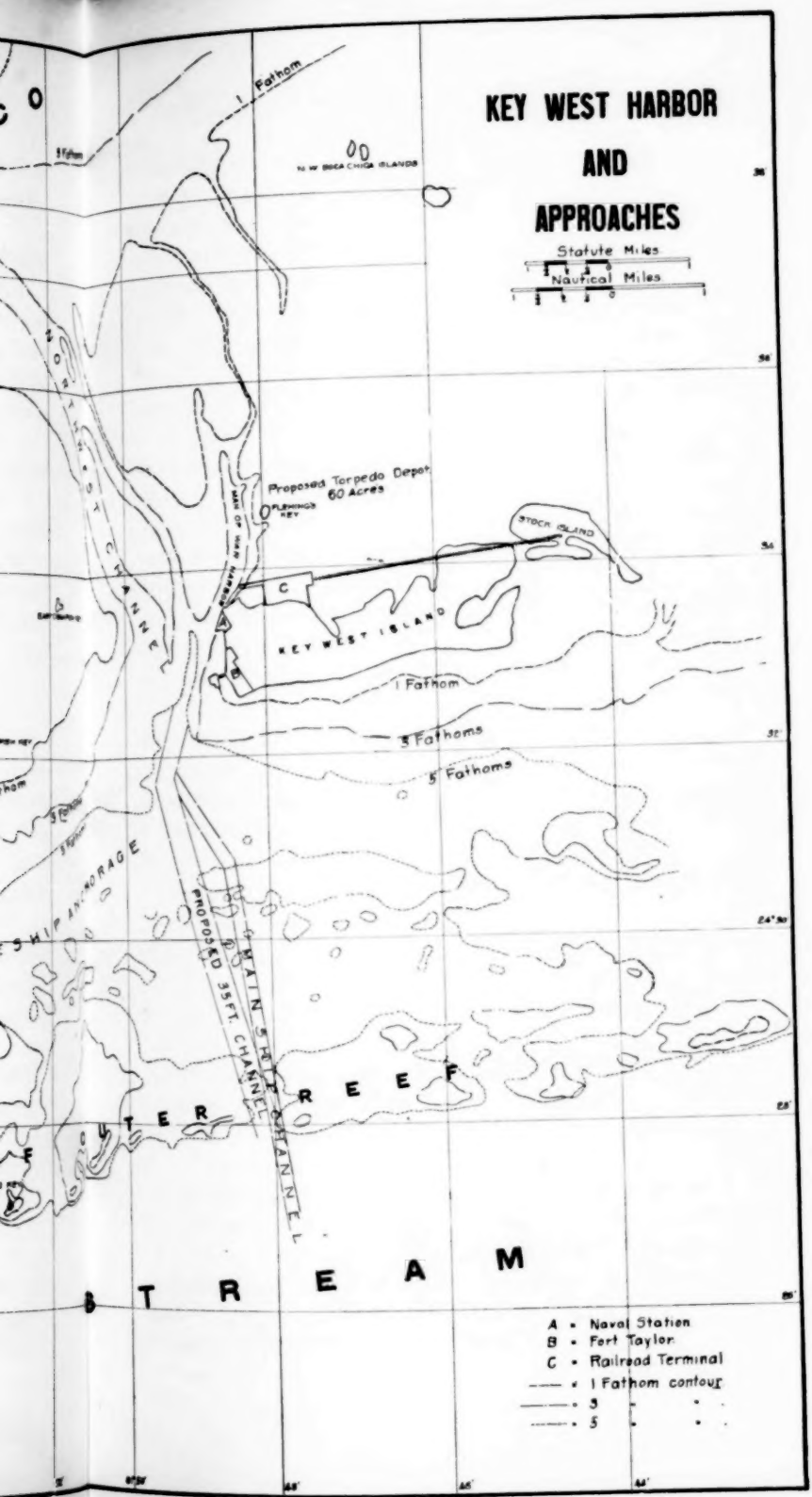
There are two channels, one north and one south, of this key. The southern channel runs around to the eastward and joins the channel on the north side, that leads to northward to the deep water north of the flats, north of Key West. The channels are shallow but could readily be made navigable by torpedo-boats, to give them access to the deep water in Florida Bay, for torpedo practice, etc. There are many channels leading from the Bay of Florida southward, in between the different keys, to the Straits of Florida.

The largest vessels, drawing thirty feet of water, can go up to Fleming Key, which has thus all of the natural advantages which could be demanded of a site for a large and important naval torpedo depot. The area would be large enough to accommodate all of the necessary buildings, docks, etc., and the roofs of these buildings will supply sufficient drainage area for an adequate supply of rain water, in cisterns, to supply all of the needs of a torpedo depot. Water for steaming purposes for vessels of the navy and also for torpedo-boats, would be supplied from the present naval station, which as previously stated, will eventually have a storage capacity of two million gallons.

The idea of using Fleming Key for a torpedo station was first suggested by the writer in the summer of 1905, and in the annual report of the Chief of the Bureau of Ordnance, for 1905, this project was strongly recommended.

In June, 1907, the Florida East Coast R. R. Co. sent dredges across the channel, immediately south of Fleming Key, and began to pump mud from the shoals adjacent to Fleming Key, on to Trumbo Island. Legal measures were taken to stop the railroad company, from trespassing upon the U. S. Navy reservation. The railroad authorities had been previously informed that Flem-

GULF OF MEXICO
5 Fathoms
1 Fathom
Navy Rifle Range
BELKNAP BASIN
BATTLESHIP ANCHORAGE
LINE
GULF
GULF


KEY WEST HARBOR
AND
APPROACHES
Statute Miles
Nautical Miles
1 Fathom
Proposed Torpedo Depot
60 Acres
FLEMING'S KEY
STOCK ISLAND
KEY WEST ISLAND
1 Fathom
3 Fathoms
5 Fathoms
SHIP ANCHORAGE
PROPOSED 35FT. CHANNEL
MAIN SHIP CHANNEL
REEF
STREAM
A • Naval Station
B • Fort Taylor
C • Railroad Terminal
1 Fathom contour
3 " "
5 " "

ing Key and its adjacent shoals belong to the navy. After considerable negotiation the railroad company agreed to deposit upon Fleming Key 165,000 cubic yards of mud, whenever the Secretary of the Navy should require them to do so. This is the quantity which had been removed from the shoals adjacent to Fleming Key.

This will not be sufficient fill to cover Fleming Key as required in the present plans for the torpedo station, but it is a large contribution, and will aid the work of developing this important naval base.

Man-of-War Harbor was so designated because of the deed which specified Fleming Key and its adjacent shoals and Man-of-War Harbor as belonging to the navy. The deed includes this Man-of-War Harbor. Man-of-War Harbor was formerly known, and is still frequently designated as Hurricane Harbor, because of its having perfect shelter in stormy weather. Even in the most violent storms it is always perfectly smooth, and it is customary for small craft to take refuge therein when it comes on to blow.

The channels into Key West Harbor are all in urgent need of improvement. The main ship channel is entirely inadequate, having a sharp ugly turn at the triangle. A recent examination with the wire-drag system, by the Coast and Geodetic Survey, shows that there is one obstruction with but twenty-five feet of water, near the triangle, where thirty feet is shown on the chart.

The chart of the harbor of Key West shows a direct channel from the sea buoy, leading to the beacon in the N. W. channel, which, though it has some obstructions, would be a much better channel than the present main ship channel. No money has ever been expended by the government for the improvement of the channels of Key West Harbor, and this recent examination shows that something must be done without delay. The work required is very little, whether for the writer's new proposed main ship channel, or for the old one.

There is another channel, known as the S. E. channel, which could also be readily improved to be a very desirable channel, for the largest vessels, of not less than thirty-feet draft. A few pinnacle-coral rocks can readily be removed. The west channel, which leads out directly toward Rebecca Shoal, is a very deep broad sheet of water. The chart shows five fathoms of water

throughout, but while, on the face of it this is such an excellent channel, it is but little used by large vessels. A more thorough examination is now in progress by means of these wire drags, and at all events, there is but little doubt that with but comparatively little expense, this west channel can be made into a navigable basin for the largest battleships, besides affording access to the navy yard.

The N. W. channel is chiefly used by the steamer line from Tampa to Key West. Eighteen feet of water is the most that can be obtained in this channel, which is narrow and crooked. The N. W. channel can only be used by the smaller vessels; battleships and larger vessels must necessarily use the main ship channel or the west channel, and go around Rebecca Shoals to the westward, rather than attempt to go the northward by the N. W. channel.

While Key West has an admirable climate, and beautiful weather prevails most of the time, the N. E. trade winds are often quite fresh, and for experimental work and target practice by torpedo-boats, it would be very desirable to construct a sheltered basin in the west channel. Such a basin, five miles long, and one and one-half miles wide, and not less than thirty feet deep could readily be formed by a break-water running north and south along the west side of the channel, off Fort Taylor. Torpedo-boats will then have perfectly smooth weather in which to have target practice, and the water is so clear that the bottom, at five fathoms is clearly visible, when it is smooth. The only disadvantage in regard to torpedo practice is that the bottom is full of coral rocks, loggerheads, etc., which might very seriously damage torpedoes that sink. In the early part of 1907 the Vesuvius and the third flotilla had target practice at Key West. Several torpedoes were somewhat damaged by the rocky bottom, but the damages were readily repaired, and it is doubtful whether a torpedo could strike the bottom at any place without being more or less damaged.

The third flotilla was somewhat delayed in its practice in 1907, waiting for perfectly smooth weather. They had alternate ranges, one in Hawk Channel, south of the island of Key West, and one in another channel west of the island. These they used alternately to have the best sheltered range, and the delays in choosing the best range were somewhat irksome, but the fact remains that

the third flotilla obtained better results than any other flotilla. They made eight hits out of nine shots, on their record practice which is the best that had been obtained.

The enlisted men of the torpedo flotilla were enthusiastic in their praises of the delightful climate at Key West. While the city is not attractive, the men thoroughly enjoyed the advantages of the gymnasium, reading and writing rooms, and billiard tables of the Naval Athletic Club. This Naval Athletic Club was an old building that was first fitted up by Captain Colvocoresses. It has since been improved, and now affords a splendid place for recreation for the enlisted men.

COMMERCE AND SHIPPING OF KEY WEST.

The commerce of Key West does not cut a very large figure at present. The mail steamers to Tampa, on the west coast and to Miami on the east coast, bring mail, by contract, six times a week; three times a week each from Tampa and Miama, and also from Havana six times a week. The Mallory Steamship Line is the most important, running from New York to Galveston and Mobile, touching at Key West going and coming. The S. S. *Denver,* the largest of this line, draws twenty-five feet of water. Quite a number of large Hamburg-American freight steamers, draft of twenty-eight feet, brought large quantities of cement for the Florida East Coast R. R. Co., during the past year, besides which there are occasional tramp steamers and a great many smaller craft that visit the adjacent keys, etc. The U. S. S. *Columbia* is the largest vessel of the navy that has recently visited Key West, and she made several visits last year.

The importance of the shipping and commerce of this region is chiefly emphasized by that which passes through the Straits of Florida. The following figures relative to the shipping reported from Sand Key signal station were obtained from the official report of Mr. F. E. Hartwell, the official in charge of the local U. S. Weather Bureau.

Number of vessels reported during year 1907:

West bound	1,087
East bound	198
Total reported	1,285

Number passing within sight, but at too great a distance to be identified, and not signaling station (about equally divided between east and west bound)	840
Total number observed not entering port	2,125
Number entering port, not including craft under 100 tons, approximately	728
Total number passing within sight of station	2,853

These figures show only vessels passing within sight of Sand Key, and while the total number given as passing with sight is 2853, the fact is that east bound vessels, taking advantage of the strong current of the Gulf Stream, pass far beyond sight of Sand Key, and there are surely many west bound vessels which do not pass within sight of Sand Key. These will make the total approximately 4000 vessels, yearly, which pass through the Straits of Florida, an average of about eleven daily.

This is practically the entire shipping of the Gulf of Mexico. All that come and go from Texas, New Orleans, Mobile, and the ports of Florida, must pass through the Straits of Florida. The entire commerce of the republic of Mexico, and a very large portion of the commerce of Cuba, including all of that of Havana, must pass the meridian of Key West, through the Straits of Florida.

The commerce of the ports of Texas, especially the exportation of Texas oil, is greater than is generally supposed, and is constantly increasing. The development of the railroad, north and south, through Texas, and from the great Northwest, brings additional exports of produce that must pass Key West. A constantly increasing commerce from the Mississippi River passes Key West, especially in the winter when the Great Lakes are frozen, and the cheaper water transportation routes of the Northwest are closed by ice.

Besides this commerce, which might be classified as strictly the commerce of the Gulf of Mexico, there is a considerable, and a very rapidly growing commerce through the Yucatan Channel. A greater part of it goes direct to New Orleans and Mobile and Galveston, but some passes through the Straits of Florida. This commerce is chiefly that from the Caribbean ports of Central America and Panama. With the construction of the Panama Canal, this commerce will be greatly increased. The currents

would make it more favorable for vessels from Panama to proceed via the Yucatan Channel, the Straits of Florida and the Gulf Stream, to the northern ports of United States, and to Europe. While on the other hand, in going to Panama, from the northern ports of the United States, the route would be to the eastward of Cuba, so that probably about one-half of the commerce of the Panama Canal will pass by Key West.

The realization of this immense commerce, its rapid growth, and the importance of Key West, by which all of this commerce must pass, emphasizes the strategic value most potently. In case of war, an enemy would find the Straits of Florida the most vulnerable point to attack American commerce, and the only, and best protection this commerce could possibly have is a first-class naval base, especially for torpedo flotillas, at Key West. A battle-fleet may control these straits and defend them, but the exigencies of war may call the battle-fleet elsewhere, especially nearer the Panama Canal, with secondary naval bases at Chiriqui Lagoon and Guantanamo by means of the route via the Yucatan Channel.

The wireless stations in the Yucatan Channel, in communication with that of Key West, will necessarily place the commerce of that channel under the control of the great naval base at Key West. And it is well to remember that the wireless will also place the routes to the Panama, eastward of Cuba, in communication with Key West, and this will give Key West practically the entire command of all the commerce of the Panama Canal which crosses latitude of Key West, west of Porto Rico, as indicated by the strategic lines of force.

THE PRESENT NAVAL STATION AND PROPOSED IMPROVEMENTS.

The naval station at present consists of two coal sheds with its piers and approaches, with a site along the beach. These coal sheds and piers are on the bulkhead lines of the channel thirty feet deep. A pier for the light-house establishment lies between the two piers of the naval station. The naval station is also separated in two parts on shore, by the custom house building and ground. On the north side of the custom house there is an old storehouse, in which are located the offices of the commandant, general storekeeper, the doctor, etc. The distilling plant and two cisterns are alongside this old storehouse, west of which there is a new fireproof building for the storage of oils, and there is an

old frame building used by the Department of Construction and Repair. On the south side of the custom house is the main territory of the the naval station, consisting of a series of four old wooden coal sheds, a very fine, modern, commodious equipment building and machine shop, etc., the wireless power plant on the first floor, and a sail loft on the second floor. The sail loft is a very large, commodious room, in which the marines are now quartered. Ample space is therein provided for a guard of one hundred marines. Adjacent to this building is the boiler house to supply power to the machine shop. Just south of this there is a kitchen and a large mess hall for the marine guard.

In the next block, just south of the equipment building, there is first the commandant's quarters, the foundry, the blacksmith shop, the steam engineering machine shop, and a small office building for the offices of the Department of Yards and Docks. These last few buildings are all along the water front.

Across the street, to the eastward is the newly acquired territory of about two city blocks. In the southwest corner, opposite the steam enginering shop there is a recreation building for the Naval Athletic Club, fitted up with a gymnasium on the first floor and pool rooms, reading rooms, etc. on the second floor. Next to this, on the same street, there is a building for yards and docks; next, on the corner there is a building, formerly a residence, which is now used as quarters for the wireless operators. The three masts of the wireless installation enclose most of the block east of the foundry. In the center of the triangle formed by these three masts is a new wireless operating house, in which is installed the wireless apparatus. On the first floor of the wireless operators quarters there is an office for the wireless, and also for the Board of Labor Employment. In this same block, further east are three quarters for officers, one of them for the medical officer, a second for the civil engineer of the yard, and the third is temporarily assigned to the marine officer.

On the north side of Caroline street, opposite this block, there is the pumping house, with elevated standpipe and a large cistern. While at the main gate, at the entrance to Whitehead and Caroline streets there is a large building, formerly the old postoffice building of Key West, which was acquired with the purchase of this additional land in 1904. This building is fitted up for the seamen's quarters, and it is well adapted for that purpose. The

basement of this building has been fitted up for a guard room for the daily guard of marines at the main gate.

In this block, just north of Caroline street, foundations have been laid for an elevated tank and large steel cistern, which will soon be brought here from Tortugas, and erected.

A large storehouse for the Supplies and Accounts Department, is to be built in this triangular block, opposite the old wooden sheds; and between these and the building for the general storekeeper, there is to be a building for the dispensary.

Fire mains, fresh-water supply and storage pipes, together with a sewerage system have all been laid, and are in use throughout the entire area.

Under construction there is a quay wall, which runs out in line with the storehouse and around pier A. An extension for coal shed A, has been appropriated for, but the work has not yet been commenced, except on the plans. The plans of this additional coal shed have been subjected to considerable discussion. The present commandant is strongly in favor of building the shed in such a way that the coal can be stored either dry or under water, the salt water to form the roof and cover the coal. This plan of storing coal under salt water has not yet been approved by the bureau, but in any case, the additional coal shed will soon be built.

The coal hoisting machinery at this station is in excellent condition. The capacity for handling coal is about one hundred tons an hour, as a maximum, eight hundred tons of coal have been handled in eight hours' work. The distilling plant has a capacity of 10,000 gallons a day, and should be enlarged.

A marine railway, with a capacity of 800 tons, to take the largest torpedo destroyers, is in course of construction. The site of this marine railway runs out from the shore-line, near the north end of the steam engineering building, just south of the commandant's quarters.

There is a building appropriated for the construction and repair machine shop, and it is proposed to locate that on a site now submerged, west of the sea wall, opposite the steam engineering building, and south of the marine railway.

A foundry to cost $60,000 has been repeatedly urged in the estimates by the Bureau of Steam Engineering. This foundry should occupy the site between the new construction and repair

building and the present steam engineering machine shop, because the foundry will be used by both the steam engineering and the construction and repair machine shops. This would put the construction and repair building further out on the submerged area west of the steam engineering building.

The proposed improvements also contemplate an additional pier on the bulkhead line, south of the present pier B, the approach to the new proposed pier to be south of the marine railway, and thence to the proposed site of the construction and repair building. The submerged area enclosed by this new proposed pier and its approach is limited on the south by the extreme boundary line of the station (that boundary line being at present Eaton street), out across the water to meet the bulkhead line on the channel. On this area it is proposed to locate a floating drydock to take the biggest battleships. It is also proposed to acquire two more city blocks, immediately south of the present limit of the naval station, from Whitehead street to the water front. On this area there is located at present, the marine hospital and the weather bureau building. The boundary line would then run along Fleming street and the bulkhead line, and would include a much larger area for a floating drydock.

The boundary line would then adjoin that of the Fort Taylor reservation, both on the water front. The riparian rights of all this water front now belong to the army, navy, and marine hospital service.

The army is building a submarine torpedo and mine depot here, around the north bastion of Fort Taylor, inside the bulkhead line. The chart * herewith shows the development of this new territory, especially the use of the two new city blocks for marine barracks, marine officers' quarters, and a marine parade ground, to which may be added a rifle range, though the rifle range at Fort Taylor has been, and probably always will be available for the use of the navy and marines.

The proposed improvements do not contemplate any administration building, as efforts have been made by the citizens of Key West and the officials generally, to have a new custom house and postoffice erected elsewhere in the city. This removal would make the present postoffice a most desirable acquisition for the navy yard as an administration building. It would also involve

* Omitted.

the removal of the light-house establishment and its pier to some other place in this neighborhood. It has been suggested that the light-house establishment could move to one of the keys, Man or Woman Key, on the north side of the west channel. All of the keys on the north side of the west channel belong to the U. S. government, and have been reserved for the army and navy. One of these keys would form an admirable site for the light-house establishment. Frankford bank, opposite Trumbo Island, and west of Man-of-War Harbor has also been suggested.

The removal of the present postoffice and the light-house establishment with its pier, and pier approach, is really essential. The area now occupied by the light-house pier and its approach should be dredged out into a slip as proposed on the present chart of improvements.

The station, as thus described, with its improvements provides for the necessary buildings for a navy yard, except for ordnance. The ordnance department will have its buildings, etc., on Fleming Key, where there is available a site for the construction of a torpedo depot, like that which now exists at Newport, R. I., with much better facilities in every respect than it would be possible to have at Newport.

The keys on the north side of West channel, run as far as 20 miles west of Key West, and are available for naval purposes, and they would be desirable for the erection of magazines for the storage of explosives. Dry Tortugas possesses peculiar advantages for a naval magazine. Woman Key and Man Key are each over 1200 yards long, and would furnish good sites for rifle target ranges. Woman Key is about one mile north of the late Admiral Belknap's proposed sheltered basin for battleships' anchorage, and it would be advantageous to erect butts and lay out target ranges on these keys, as has been done at Guantanamo.

OUTLINE OF THE NEEDS OF THE NAVAL STATION.

To take advantage of the strategical value of Key West the following items are briefly summarized as urgently necessary to be done as soon as possible:

(a) The development of the naval station as outlined and authorized to date.

(b) Extension of the quay wall along the channel bulkhead line to extreme southwest limit of naval station area, now submerged.

(c) Removal of the light-house establishment and pier to some other place in the harbor.

(d) The acquisition of the present postoffice building as an administration building.

(e) The acquisition of two city blocks between water front at Marine Hospital and Whitehead street and between Fleming and Eaton streets for marine barracks, parade ground, and quarters for an expeditionary force of a regiment of marines.

(f) Preparing basin for floating dock in the submerged area, or for graving drydock or for both when additional area under item "e" shall have been secured.

(g) The organization of an expeditionary force, for which a complete outfit for thorough equipment, should be kept immediately available at this station.

(h) Besides the buildings previously mentioned arrangements should be provided for storage oil tanks, for oil fuel when the navy decides to adopt oil fuel.

(i) The creation of a torpedo station as complete as that which is now at Newport, R. I., with addition of basins, etc., for torpedo-boats, etc., on the U. S. Naval Reservation at Fleming Key.

(j) The utilization of one or more of the keys on the north side of West channel for naval magazines; also for small arm target ranges, as at Guantanamo.

(k) Improvement of the harbor by dredging to remove a few shoals to give a minimum depth of 30 feet of water all the way to Fleming Key.

(l) The improvement of the harbor and the adoption of the new straight channel proposed by the writer instead of the present main ship channel and dredging for minimum depth of 35 feet to the deep basin for battleship anchorage in the west channel off Fort Taylor.

(m) The arrangement of a basin 5 miles by 1½ miles wide by bulkhead along the west side of channel west of Fort Taylor for smooth water for battleship anchorage and torpedo target practice range.

(n) The rehabilitation of Dry Tortugas as a coaling depot for the navy together with such other of the many naval purposes for which the old Fort Jefferson offers special advantages; such as, site for naval magazines, naval hospital, etc.

(o) Action by the joint army and navy board for erection of fortifications at Sand Key and outer line of reefs to protect approaches to Key West Harbor.

(p) The immediate assignment of reserve torpedo-boats and submarines to the naval station at Key West for constant drill and the investigation of the channels in the vicinity for the command of the Straits of Florida.

(q) It is also recommended that besides the assignment of the reserve submarines and torpedo flotilla, the cruising flotilla should cruise every winter in this vicinity to investigate the best possible conditions for the command of the Straits of Florida and protection of the commerce of the Gulf.

(r) The assignment of all naval vessels, battleships and cruisers on the Atlantic coast to the naval base at Key West for squadron drill along the strategic lines of force radiating from Key West, to investigate all the potentialities of those lines of force for commanding the approaches to the Panama Canal.

By the completion of the foregoing briefly summarized improvements to develop the naval station at Key West into a first-class navy yard and torpedo base, we shall fully realize the strategic value of this site.

The vast commerce of the Gulf will have adequate protection. All the routes to the Panama Canal will be easily guarded both east and west, as indicated by the strategic lines of force from Key West, east, to the Windward Islands, and west, to Yucatan Channel.

Cuba is under its immediate command, besides being a bulwark to the southward and it will be desirable to have coaling stations at Guantanamo, Puerto Rico, and Culebra, together with naval stations and docking facilities at remote Gulf ports and along the coast south of Hatteras; but these places can only be of secondary importance. Key West is of greater strategic value than all the seven navy yards and naval stations at New Orleans, Pensacola, Charleston, Port Royal, Guantanamo, San Juan and Culebra combined. The naval station at Key West should be developed into a first-class base.

Do it now before the completion of the Panama Canal.

HISTORICAL SUMMARY FOR KEY WEST, FLA., FOR 1897.

ABRIDGED ANNUAL METEOROLOGICAL SUMMARY FOR KEY WEST, FLA., FOR 1907.

Month.	Temperature.			Relative Humidity.	Precipitation.		Wind.			Number of Days.										Month.
	Mean.	Maximum.	Minimum.	Mean	Total.	Maximum in 24 hours.	Average hourly velocity.	Prevailing direction.	Maximum velocity.	No. of days with gales (40 miles or more).	Clear.	Partly cloudy.	Cloudy.	Precipitation. .01 inch and over.	Precipitation. .04 inch and over.	Snow.	Hail.	Dense fog.	Maximum temp., 90° or above.	Minimum temp., 32° or below.	Thunderstorm.	
	°	°	°	%	In.	In.	m.p.h.		m.p.h.													
January	71.4	80	63	80	.11	.05	11	NE	24	0	18	10	3	6	0	0	0	0	0	0	0	January
February	69.8	80	58	76	.20	.08	9	NE	35	0	15	12	1	1	6	0	0	0	0	0	1	February
March	75.0	83	64	76	Tr.	Tr.	8	E	24	0	28	2	1	0	0	0	0	0	0	0	0	March
April	75.2	86	67	72	.46	.29	10	SE	48	1	22	7	1	4	4	0	0	0	0	0	1	April
May	80.7	88	69	74	3.62	2.09	9	E	40	1	17	10	4	8	5	0	0	0	0	0	6	May
June	81.4	89	70	74	5.96	1.31	8	SE	50	1	13	10	7	12	9	0	0	0	0	0	14	June
July	83.8	91	74	71	.68	.24	7	E	30	0	15	13	3	10	6	0	0	0	5	0	12	July
August	83.6	92	71	72	2.16	.64	7	E	28	0	10	17	4	12	9	0	0	0	12	0	13	August
September	82.4	90	72	76	8.17	5.09	8	E	30	0	11	18	1	16	12	0	0	0	4	0	14	September
October	78.7	89	69	74	2.10	1.18	9	NE	25	0	18	10	3	6	5	0	0	0	0	0	3	October
November	76.2	84	67	79	1.49	.96	9	NE	26	0	17	8	5	7	4	0	0	0	0	0	2	November
December	70.8	82	58	81	1.80	.60	11	NE	33	0	15	13	3	7	6	0	0	0	0	0	2	December
YEAR	77.4	92*	57†	75	29.65	5.09‡	9	NE	50§	3	199	130	36	94	62	0	0	0	21	0	68	YEAR

* August 13. † April 3. ‡ September 14 and 15. § June 1.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NOMOGRAMS FOR DEDUCING ALTITUDE AND AZIMUTH AND FOR STAR IDENTIFICATION AND FINDING COURSE AND DISTANCE IN GREAT CIRCLE SAILING.

By LIEUTENANT RADLER DE AQUINO, B. N.,

Naval Attaché to the Brazilian Embassy.

The ingenious method, erroneously called "The New Navigation," which was invented thirty-four years ago by Admiral Marcq Saint Hilaire, French Navy, for determining lines of position at sea, is generally recognized nowadays by intelligent navigators to be superior to all others. This method is also superior to all others for determining geographical position at sea when the position given by account (D. R.) is in doubt. Although better results are obtained by determining longitude when the latitude is known *exactly* (which often happens during the twilight and on moonlight nights by the observation of stars and planets), or by determining the latitude when the longitude is known *exactly*, yet we prefer to treat *all* observations by Marcq Saint Hilaire's method. In the particular cases mentioned, the true position of the ship can by means of a small correction be easily deduced from the position found by the method of Marcq Saint Hilaire from the position by account (D. R.).

If A is the ship's position by account and BB' the line of position, B will be the ship's position by Marcq Saint Hilaire's method, C the ship's position by determining the longitude by means of the latitude, and D the ship's position by determining the latitude by means of the longitude (Fig. 1).

The distance between A and B is the difference between the true altitude and the calculated altitude (commonly called the *zenith difference*) and the angle S_1AG is equal to the body's

azimuth. Therefore, when AB and angle S_1AG are known, it is easy to determine the corrections.

The advantages of the method of Marcq Saint Hilaire are due to its exactness and the generality of its application and, as Commander W. C. P. Muir, U. S. Navy, Head of the Department of Navigation, U. S. Naval Academy, explicitly states in heavy type in his excellent treatise on "Navigation and Compass Deviations," 1906, page 638: *"it is available practically without limitations as to azimuth, altitude, or hour angle, and may*

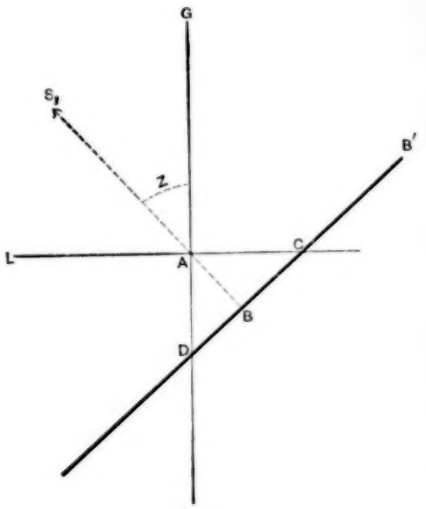

FIG. 1.

be used to work a sight whether a time sight, a $\phi''\phi'$ sight, or one of a body observed near the meridian." [1]

There is but one class of exceptions to the proceedings by which we lay down the line of position as a straight line according to Marcq Saint Hilaire's method and that is where all other methods fail too: it is when the altitude of the observed body is greater than 85°. In this class of cases the straight line can no

[1] Vide for details the author's "O Methodo de Marcq Saint Hilaire," Imprensa Nacional, Rio de Janeiro, 1902. Reprinted from the *Revista Maritima Brazileira*, Nov. 1899, Jan. 1900, and Oct. 1902, by order of the Minister of Marine.

longer be considered a practical substitute for the circle of position on account of the smallness of the zenith distance, but in these cases the actual position line or circle of position may be readily laid down upon a chart or elsewhere.[2]

The determination of geographical position and of a line of position by Marcq Saint Hilaire's method requires a knowledge of the ship's position by account (D. R.) from which the altitude and azimuth of the observed body due to this position of the observer are calculated.

In Fig. 2, P is the elevated pole, Z the zenith by account, and M the observed body whose altitude is h and declination δ. PZ is the colatitude $= 90° - L$.

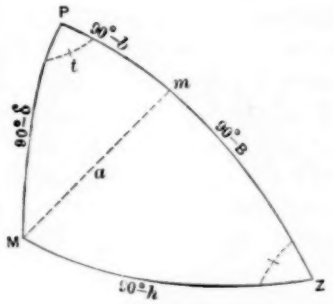

FIG. 2.

If we let fall a perpendicular from M on PZ, it will divide the triangle of position into two right-angled triangles, and altitude and azimuth can be easily determined by solving these two triangles.

From well-known theorems in Spherical Trigonometry[3] we

[2] Vide an article by the author: "Limites de coincidencia da recta Marcq Saint Hilaire com a curva de posição correspondente" in the *Revista Maritima Brazileira*, July, 1906, page 41. For an altitude of 86° the useful part of the straight line of position is 44 miles long. For 89° it is only 22 miles. For a given latitude the most favorable circumstances for determining lines of position are when the observed body's hour angle, declination, and zenith distance are the greatest practicable.

[3] Vide *Chauvenet*, A Treatise on Plane and Spherical Trigonometry, 9th ed., Philadelphia, page 169, or the author's "Estudo elementar de Trigonometria Espherica e algumas das suas applicações á Astronomia Espherica, Navegação e Geographia," edited by H. Garnier, Paris and Rio de Janeiro, 1903, page 26.

obtain the following two groups of formulæ which bind together several of the elements of the two right-angled triangles:

First group sines and cosines only.

$$\begin{cases} \sin a = \cos \delta \sin t \\ \sin a = \cos h \sin Z \\ \sin \delta = \cos a \sin b \\ \sin h = \cos a \sin B \end{cases}$$

Second group cotangents and cosines only.

$$\begin{cases} \cot b \cot (90^\circ - \delta) = \cos t \\ \cot B \cot (90^\circ - h) = \cos Z \\ \cot t \cot (90^\circ - a) = \cos b \\ \cot Z \cot (90^\circ - a) = \cos B \end{cases}$$

These two independent groups of four formulæ each, appearing now for the first time locked together on account of their similarity, permit the simple, easy, and rapid determination of altitude and azimuth and of other elements in various other problems which can be solved by means of these equations.

In order to facilitate these determinations many tables based on the division of the triangle of position into two right-angled triangles have been devised, constructed and published, and the perpendicular has either been dropped from the body on PZ or from Z on PM.

Lord Kelvin's hour angle and azimuth tables,[4] which are more naturally adapted for calculating altitudes and azimuths, as we have shown in our improved edition of his tables,[5] are based on the 3d and 4th formulæ of each of the two groups, while Fuss' altitude and azimuth tables[6] are based on the 1st and 4th formulæ of each of the two groups.

A general review of these tables and many others, and also of Favé and Rollet de l'Isle's[7] and Littlehales'[8] graphical tables has been made by Dr. Giuseppe Pesci of the Royal Naval Academy of Livorno, Italy, in a very interesting study entitled, "Resolução Nomographica do Triangulo de Posição," translated from the Italian into Portuguese by the author of this article and recently

[4] Tables for facilitating Sumner's Method at Sea, London, 1876.
[5] A Navegação sem logarithmos, Imprensa Nacional, Rio de Janeiro, 1903.
[6] Tablizti dlya Nakasdeniya Visott i Azimutoff, Saint Petersburg, 1901.
[7] Abaque pour la détermination du point à la mer, *Annales hydrographiques*, Paris, 1892. *Revue maritime et coloniale*, Paris, January, 1893.
[8] Altitude, azimuth and geographical position, Philadelphia, 1906.

published in the three numbers of the *Revista Maritima Brazileira* for November and December, 1907, and February, 1908.

They all have their advantages and disadvantages, but the disadvantages are especially inherent in the numerical tables on account of the required numerical interpolations which lead to errors and loss of time, not to mention the turning of pages to find the data.

For these reasons, I have looked for *Nomography*[9] to give an easy and very quick solution of the problem and I hope this article will be of interest to astronomers and navigators and also to naval tacticians and ordnance officers, and serve to stimulate them to work out many of their problems by *Nomography*. I hope also that Dr. Pesci's nomogram for solving the equations of the 2d group of formulæ will prove useful as a substitute for the time-azimuth tables actually in use, since these present the same inconveniences as all tables, and that both nomograms will prove useful for check work which will be greatly facilitated and expedited by their use.

To Dr. Pesci I owe my enthusiasm for *Nomography*, and the recognition of its important possibilities for solving easily and rapidly various problems in navigation, naval tactics, balistics, target practice, etc.

LAFAY'S NOMOGRAM.

All four of the formulæ of the first group are of the same type, namely,

$$\sin \alpha = \sin \beta \sin \gamma$$

for which Captain Lafay constructed, in 1895, a very interesting nomogram[10] in connection with his research work in elliptic polarization. This nomogram is based on d'Ocagne's ingenious method of alined numbered points.

[9] Vide *Maurice d'Ocagne*, Traité de Nomographie, Paris, 1899 and Exposé synthétique des Principes fondamentaux de la Nomographie, 1903. (Extrait du *Journal de l'Ecole Polytechnique*, 1903); *Schilling*, Ueber die Nomographie von M. d'Ocagne, Leipzig, 1900; *M. J. Eichhorn*, The construction and use of graphical tables (*Western Electrician*, Chicago, March 9, 1901, page 162); *Soreau*, Contribution à la Théorie et aux Applications de la Nomographie. Mémoirs de la Société des Ingenieurs Civils de France, August, 1901. *Ricci*, La Nomografia, Rome, 1901, *G. Pesci*, Cenni di Nomografia, Livorno, 1901. Sobre Nomografia Elemental. Revista Trimestral de Matemáticas, Zaragoza, año V, 1905, pages 138-161, and Lezioni di Nomografia, Livorno, 1905. *Perret*, Annales hydrographiques, Paris, 1904.

[10] Journal de Physique théorique et appliqué, 3eme serie, t. IV, April, 1905, page 178.

A very elementary demonstration of it is given by *Soreau* (loc. cit.) as follows:

Let us take for the axes of co-ordinates three lines meeting in the same point in such a manner that one bisects the angle made by the other two.

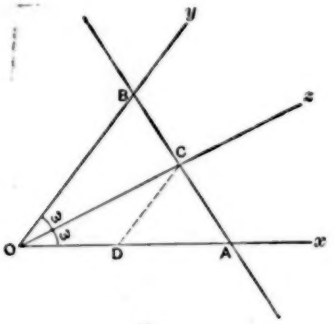

FIG. 3.

It can be easily shown that if three points, A, B, and C, whose respective co-ordinates are x, y, and z, are in a straight line or *alined*, they satisfy the following equation

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$$

which appears in Optics, as a relation between focal distances. Now

$$\frac{OD}{OA} + \frac{CD}{OB} = 1.$$

In the isoceles triangle COD

$$OD = CD = \frac{OC}{2\cos\omega}$$

and therefore

$$\frac{1}{OA} + \frac{1}{OB} = \frac{2\cos\omega}{OC}$$

If we take

$$x = OA = l.f_1$$
$$y = OB = l.f_2$$
$$z = OC = 2\,l\cos\omega.f_3$$

we will have

$$\frac{1}{f} + \frac{1}{f_2} = \frac{1}{f_3}$$

where f_1, f_2, and f_3 are three functions and l a certain factor of amplification or reduction.

By a very ingenious artifice, Captain Lafay shows how the equation

$$f_1 + f_2 = f_3$$

(or $f_1 \cdot f_2 = f_3$ after applying logarithms to both members) can be transformed in an infinity of different ways by multiplying each function by k and adding $2h$ to each member of the equation.

Thus

$$(h + kf_1) + (h + kf_2) = 2h + kf_3$$

or

$$\frac{1}{\frac{1}{h + kf_1}} + \frac{1}{\frac{1}{h + kf_2}} = \frac{1}{\frac{1}{2h + kf_3}}$$

This transformation is necessary and advantageous when the functions vary between 0 and $\pm \infty$, thus giving a finite dimension to the scales, which otherwise would be infinitely long.

Returning to our fundamental equations we have

$$\sin a = \cos \delta \sin t$$

or

$$-\log \sin a = -\log \cos \delta - \log \sin t$$

or

$$2h - k \log \sin a = h - k \log \cos \delta + h - k \log \sin t$$

Referring to the formulæ in x, y, and z, we will have

$$x = \frac{l}{h - k \log \cos \delta}, \quad y = \frac{l}{h - k \log \sin t}, \quad z = \frac{2l \cos \omega}{2h - k \log \sin a}$$

If, according to Captain Lafay, we take $h = 1$, $k = 10$, and $\omega = 30°$, supposing $l = 72^{mm}$, the nomogram will take the form of Fig. 4.

It is only necessary to calculate the values of y. The values of z are readily found by alining the point $\delta = 0°$ with the successive numbered points on t (values of y). The intersections of these alinements with the bisector will give the numbered points corresponding to the different values of a, hence the value of z. These numbers are the same as those corresponding to y, because the equation shows that when $\delta = 0°$, $\sin a = \sin t$ or $a = t$. The positions of these points can be checked by using the point $t = 90°$ and alining it with the points corresponding to the

successive values of δ (values of x). The numbers in this case are the complements, because when $t = 90°$, sin $a = \cos \delta$ or $a = 90° - \delta$.

When two of the quantities are given in the equation sin $a = \cos \delta \sin t$ to find the third, it is only necessary to aline the numbered points corresponding to the given data and read the numbered point where the line intersects the proper scale. A visual interpolation is generally necessary for points between the numbered ones. This is done in the same way as on any scale.

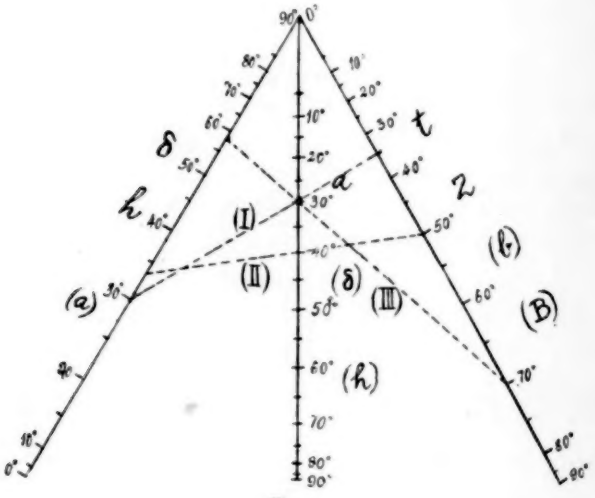

FIG. 4.

Examples: I. $\delta = 30°$, $t = 35°$, we find $a = 29°, 8$. II. $a = 40°$, $\delta = 33°$, we find $t = 50°$. III. $\delta = 58°$, $a = 30°$, we find $t = 70°$.

DETERMINATION OF B.

When the perpendicular falls within the triangle of position, as in Fig. 2, we have

$$PZ = 90° - L = 90° - b + 90° - B$$

and therefore

$$B = 90° + L - b$$

If each one of the other three distinctive positions a celestial

body can occupy, according to its declination and hour angle and the latitude of the observer, were considered, we would have the following precepts for finding B:

$$\delta \text{ and } L \text{ same name} \begin{cases} t<90^\circ \begin{cases} b>L : B=(90^\circ+L)-b\,;\, Z<90^\circ \\ b<L : B=(90^\circ+b)-L\,;\, Z>90^\circ \end{cases} \\ t>90^\circ \ldots\ldots : B=(L+b)-90^\circ\,;\, Z<90^\circ \end{cases}$$

$$\delta \text{ and } L \text{ different names} \ldots\ldots : B=90^\circ-(L+b)\,;\, Z>90^\circ$$

A complete discussion of these formulæ was made recently by Dr. Pesci in the *Revista Maritima Brazileira* (loc. cit.) and therefore we will not repeat it here.

By these formulæ B can be obtained from b and L without giving consideration to algebraic signs. The brackets show that the quantities in them ought to be added first in order to simplify calculations.

The determination of B is thus very simple. In the first two cases, which are the most frequent in practice, 90° is always added to the smaller of the two quantities b and L; and from this sum is subtracted the larger of the two.

In the third and fourth cases b and L are always added together. If their sum is greater than 90°, 90° is subtracted from it. If the sum is smaller than 90°, it is subtracted from 90°.

The precepts and formulæ are set forth on the large scale nomograms as a convenient aid to the memory in practical work.

We will now show how with Lafay's nomogram and the formulæ of the first group, altitude and azimuth can be easily and rapidly determined, given the hour angle t, the declination of the body δ, and the latitude of the observer L.

The key to the nomogram is as follows:

$$\begin{cases} a \text{ is determined by } \delta \text{ and } t \\ b \text{ " " " } a \text{ " } \delta \\ h \text{ is determined by } a \text{ and } B \\ Z \text{ " " " } h \text{ " } a \end{cases}$$

Example: $L = 20^\circ\text{S}$, $\delta = 30^\circ\text{S}$, $t = 35^\circ$. We will find $a = 29^\circ\ 47'$, $b = 35^\circ\ 11'$, and $B = 74^\circ\ 49'$ and $h = 56^\circ\ 53'$ and $Z = 65^\circ$, 4. In this case the azimuth is called a time-altitude-azimuth.

DR. PESCI'S NOMOGRAM.

All four of the formulæ of the second group are of the same type, namely,

$$\tan \alpha \tan \beta = \sin \gamma$$

for which Dr. Pesci has just published a nomogram (*Revista Maritima Brazileira* for February, 1908, page 1036).

It will be readily seen that all the elements in Dr. Pesci's formula are the complements of those in the formulæ of the second group.

This nomogram, as well as Lafay's, is based on d'Ocagne's method of alined numbered points; and an elementary demonstration of it is given by Dr. Pesci on page 1037 of the *Revista Maritima Brazileira* for February, 1908.

Fig. 5 shows the nomogram for $\cot b \cot (90° - \delta) = \cos t$ with $l = 100^{mm}$. The scale on the right, parallel to the one on the left, is an ordinary scale of natural cosines on which are read t, Z, b, and B in the second members of the second group of formulæ. The graduation of the diagonal scale is made by the following relation:

$$\left.\begin{matrix}\text{Distance from} \\ \text{zero of scale}\end{matrix}\right\} = \frac{l\sqrt{2}}{1 + \cot b}$$

where l is the length of the parallel scales and also the distance between them. The scale on the left is an ordinary scale of cotangents, and, as will be noticed, runs only from 45° to 90°. This valuable restriction placed on the scale permits a greater approximation to be obtained from it, and is a consequence of the nature of the equation

$$\cot b \cot (90° - \delta) = \cos t.$$

This equation cannot be satisfied when b and $90° - \delta$ are at the same time smaller than 45°, because then $\cos t$ would be greater than 1, which is absurd. Therefore, when values of b and $90° - \delta$ are given, the one that is larger than 45° is always taken on the left-hand scale and the other smaller than 45° on the diagonal scale. If this procedure is not followed the alinement will be impossible. When both are larger than 45°, it will be indifferent on which of the two scales they are read. However, in this case, for geometrical reasons, it is better to read b or $90° - \delta$ on the left hand scale and to take $90° - \delta$ or b from the diagonal scale.

This nomogram, on account of its peculiar shape, is called a "nomogram in Z." It might be more properly called a "nomogram in N," because it can be better worked upright.

In the equation $\cot b \cot (90° - \delta) = \cos t$, to find any one of the three quantities when the other two are given, it is only neces-

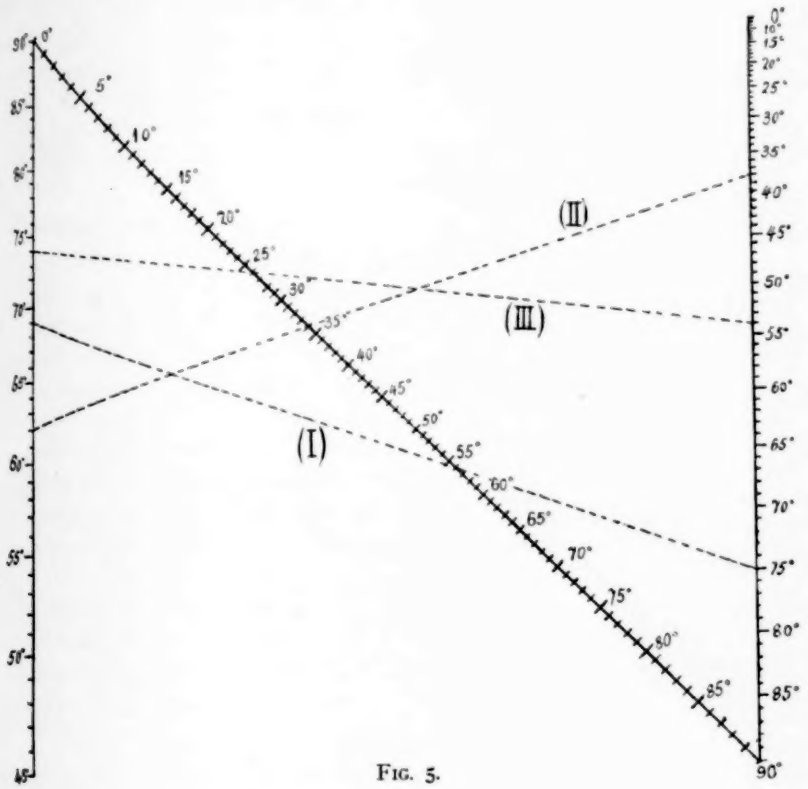

FIG. 5.

sary to aline the numbered points corresponding to the given data and read the numbered point where the line intersects the proper scale. A visual interpolation is generally necessary for points between the numbered ones. This is done in the same way as on any scale.

Examples: I. $b = 69°$, $90° - \delta = 56°$, we find $t = 75°$. II. $90° - \delta = 62°$, $t = 38°$, we find $b = 34°$. III. $b = 74°$, $t = 54°$, we find $90° - \delta = 26°$.

The key to this nomogram when used for determining altitude and azimuth is as follows:

$$\begin{cases} b \text{ is determined by } 90^\circ - \delta \text{ and } t. \\ 90^\circ - a \text{ " " " } t \text{ " } b. \\ Z \text{ " " " } 90^\circ - a \text{ " } B. \\ h \text{ " " " } B \text{ " } Z. \end{cases}$$

With these formulæ and the nomogram, it is not necessary to read $90^\circ - a$ on the scale because Z is determined by $90^\circ - a$ and B. This is important and gives h and Z independently of a, while all the elements are determined by their cotangents, and hence are the best results possible.

This is why Dr. Pesci's nomogram gives better results than Lafay's in the determination of altitude and azimuth and other problems.

Example: $L = 42^\circ$ N, $\delta = 23^\circ\ 5'$ N, $t = 49^\circ\ 41'$. We will find $b = 33^\circ\ 23'$, $B = 81^\circ\ 23'$, $90^\circ - a = 45^\circ\ 27'$, and $Z = 180^\circ - 81^\circ\ 20'$ and $h = 44^\circ\ 48'$. In this case the azimuth is called a time-azimuth.

If $t = 90^\circ$, b is also 90° and then $90^\circ - a$ cannot be determined by the third formula of the second group. But the first and third formulæ of the first group show that $\delta = 90^\circ - a$ when $t = 90^\circ$ and Z can be determined by

$$\cot Z \cdot \cot \delta = \cos B$$

If $B = 90^\circ$, Z is also 90°, and then h cannot be determined by the second formula of the second group. But the second and fourth formulæ of the first group show that h is then equal to $90^\circ - a$.

TIME-AZIMUTHS.

Time-azimuths can be easily and rapidly determined according to the first, third, and fourth formulæ of the second group, by Dr. Pesci's nomogram.

Horizon-azimuths depending upon the following formula

$$\sin Z = \cos \delta \sin t$$

when δ and t are known, and

$$\cos Z = \frac{\sin \delta}{\cos L} \text{ or } \sin \delta = \cos Z \sin (90^\circ - L)$$

when δ and L are known, can be determined by Lafay's nomogram. In this case the hour angle is given by

$$\cos t = -\tan L \tan \delta$$

and is easily determined by Dr. Pesci's nomogram.

IDENTIFICATION OF CELESTIAL BODIES.

The problem of identifying celestial bodies is the reverse of the problem of determining altitude and azimuth, and, therefore, we ought to begin with the formula in h and Z and proceed backwards until δ and t are found.

COURSE AND DISTANCE FINDING.

The problem of finding course and distance in Great Circle Sailing is the same as the problem of determining altitude and azimuth. The zenith distance or complement of the altitude corresponds to the distance, and the azimuth to the course. The only difference is that the distance between the two given points can be greater than 90°, whereas the zenith distance cannot be greater than 90°.

Our purpose is not to work out the details of each one of these problems, which are well known to all astronomers and navigators; but rather to show the advantages of solving them by means of the two nomograms, and especially by Dr. Pesci's.

It is now well known that nomograms, with their graphical readings, do away with the complications of arithmetical interpolation, replacing it with a visual interpolation and thus minimizing the chances of error and avoiding the necessity of turning the pages of tables.

As the nomograms correspond to an infinity of graphical constructions, it is desired to point out that no graphical constructions are necessary, but only graphical readings in order to solve the equation to which they belong.

In order to facilitate the alinement of any three points Messrs. Keuffel and Esser of New York were employed by me to make of xylonite a transparent straight-edge of 28½ inches in length, with a straight black line drawn through the middle of it. This is a more advantageous form of ruler than those heretofore proposed, since its use greatly facilitates the rapid alinement of the three points and permits an accurate and refined graphical reading. This ruler could also be made of glass.

Naturally the approximation obtainable from a given nomogram depends on the length of its scales, and on the accuracy with which the readings are made. For this purpose good eyesight is very valuable. Greater approximation may be obtained by the aid of a magnifier as used by engravers or with slide rules.

Large scale nomograms have been engraved upon copper plates. They are carefully printed on paper and published by the U. S. Naval Institute, and may be obtained upon application to the Secretary and Treasurer.

In Dr. Pesci's nomogram the scale is 500^{mm} long occupying an area $500^{mm} \times 500^{mm}$. With it h and Z can be obtained with an approximation of $1'$ (and in many cases with less than $1'$) which is sufficient for practical purposes.

This nomogram with a scale equal to 250^{mm} giving h and Z with an approximation of $2'$ (and in many cases with less than $2'$), is large enough for time-azimuths, star-identification, and check work. The nomogram is then much more handy.

In Captain Lafay's nomogram the outside scales are 360^{mm} long and the approximation obtainable varies with the parts of the scales employed in solving the problem. However, for practicable purposes we are of the opinion that the scale of 360^{mm} is sufficiently large.

We have limited the size of our nomograms in view of their use on board ship. For office work, where space and handiness are not so important a factor as on board ship, their size can be increased if greater approximation is desirable.

With this end in view they might also be constructed on such substances as celluloid, boxwood, aluminum and ivory; and the scales be engine-divided.

In conclusion, I wish to express to Mr. Geo. W. Littlehales, Hydrographic Engineer of the U. S. Navy Department, my hearty thanks for his kindness in revising this article and for many valuable suggestions regarding the construction of the nomograms.

WASHINGTON, *March 24, 1908.*

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NOTES ON RIFLE SHOOTING.

By MIDSHIPMAN E. E. WILSON, U. S. Navy.

These notes were assembled primarily for the benefit of midshipmen who, through lack of time, are obliged to fire at record practice with very little instruction. They are the results of three years' practice, and embody principles essential to good shooting.

Though indoor work requires no change in sight-setting, range work introduces weather conditions that may require constant alterations to keep the center of impact in the bull's-eye. The problem of anticipating these changes is nearly the whole of this great game.

Sight corrections are divided into two classes: (1) vertical, (2) lateral changes. Raising the sight-bar raises the point hit; moving it about its pivot to the right or left moves the point hit in the same direction as the sight motion.

Lateral corrections are the result of three conditions: (1) wind, (2) light, (3) mirage.

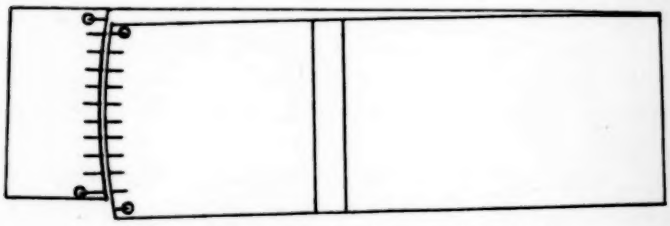
A projectile moving in a current of air is carried bodily in the direction of the current, so that it strikes the target down the wind, a distance dependent upon the component of the wind at right angles to the plane of fire. This deflection may be overcome by holding the front sight up the wind on the target, but accuracy requires that the rear sight be moved up the wind according to the graduations on it. For the Krag one point of wind per gauge gives a corresponding distance of 6 inches for every 100 yards of range. For the Springfield smaller sight graduations and shorter time of flight make this distance 4 inches per 100 yards.

Wind *force* is determined by watching the flags, mirage or anemometer. The farther the flags stand out or the faster the mirage seems to flow, the greater the wind's velocity. The port-

able anemometer gives the direct reading in miles per hour, for which tables have been computed. Wind *direction* is given by the azimuth of the flags, by wind clocks, operated by vanes and gear wheels, or by mirage. To the rifleman the range is divided like a clock with the eye at the center. Ahead is 12 o'clock, to the rear 6, to the right 3, and to the left 9. The target is similarly divided with the top as 12 o'clock.

Light affects lateral error by throwing a shadow to one side of the sight, making a rifleman unconsciously hold toward the side of the shadow.

Mirage is the name given to the heat waves which rise from the earth on a hot day. These waves flowing in one direction refract a ray of light from the target, that is, bend it aside, so that the target appears to be down the mirage stream from the



Krag wind-gauge showing 1 point right.
One point equals 6" for 100 yards.

position it really occupies. Thus a refleman does not see the bull's-eye at all, but instead an image of it. Since he aims at this image he will get a hit distant from the *bull's-eye* the same space that the *bull's-eye* is apparently moved. A mirage flowing to the left moves the image of the *bull's-eye* to the left, and the final result is obviously the same as that of a wind. It is corrected in exactly the same way, moving the sight against the flow of the stream. This mirage was so strong at Camp Perry that it seemed a perfect river, distorting the target into an oval, and almost obscuring it.

Mirage is easily detected through a telescope, slightly out of focus, and is best seen running along the top of the target. The general direction of the wind from right or left may be determined by it, but the flags must be watched also, because mirage and wind at different levels may easily flow in different directions.

The mid-range flags should be used, since they give the wind at the height of the maximum ordinate of the trajectory. Mirage is chiefly used, however, to get wind velocity—the faster the mirage, the faster the wind blowing it, and the greater must be the lateral correction.

The vertical corrections are made necessary by changes in (1) temperature, (2) barometer, (3) hygrometer, (4) light, (5) wind, (6) mirage. The first three, though factors at long range, are negligible for our purpose. As for light, a bright target and dark sight will usually cause one to aim high—for a bright sight and dark target the reverse is true. For this reason care should be taken not to stand so as to throw a shadow on a man's sights,

	Velocity of wind by flags				
Range	5	10	15	25	35
200	$\frac{1}{2}$	1	$1\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{3}{4}$
300	$\frac{2}{3}$	$1\frac{1}{3}$	$1\frac{7}{8}$	$3\frac{1}{3}$	$4\frac{1}{4}$
500	$\frac{5}{6}$	$1\frac{2}{3}$	$2\frac{1}{2}$	$4\frac{1}{6}$	$5\frac{5}{6}$
600	$\frac{3}{4}$	$1\frac{5}{6}$	$2\frac{3}{3}$	$4\frac{1}{2}$	$6\frac{1}{3}$

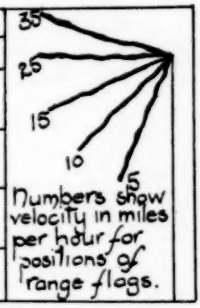


Table of wind allowances for the Krag.

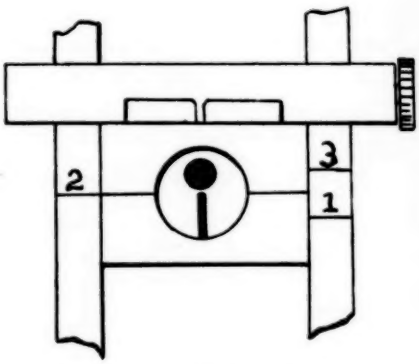
N. B.—Owing to local conditions these allowances must be exactly halved for the Naval Academy Range.

and the shadows of the clouds must be watched carefully. A change from dark to light or vice versa all along the range has little effect. Wind from 12 o'clock retards the bullet in flight and causes it to strike low; wind from 6 o'clock has the opposite effect. Mirage displaces the bull's-eye upward when it flows directly upward, but since it will not run this way long, wait until it shifts to either side to avoid changing the elevation.

Vertical deviation should never be corrected by holding. To change elevation a small amount, the vernier, an instrument so simple as to be readily understood at sight, is used. Its graduations are such that 1 minute of its limb gives 1 inch on the target for every 100 yards in range. To raise 10 inches at 1000 yards, raise by vernier 1 minute. The fact that the 200- and 300-yard

bull's-eye are 8 inches in diameter, 500- and 600-yard, 20 inches in diameter, and 800- and 1000-yard, 36 inches, gives a ready means of judging distances on the target.

Upon going on the range, try the trigger pull of the rifles on the rack until a clean, sharp one is found. Fill a belt partly full of ammunition and make it comfortably tight. If a candle is at hand, blacken both sights in the smoke, then go to the firing point and estimate the wind. Set the wind-gauge and clamp it, then set the sight at about 2 x 90 or 180 yards, taking care that it is correct and that the thumb-screw is tight. Now adjust the sling, place the arm in it and assume the easiest position, throwing the hip well forward and resting the elbow in the belt. Draw the

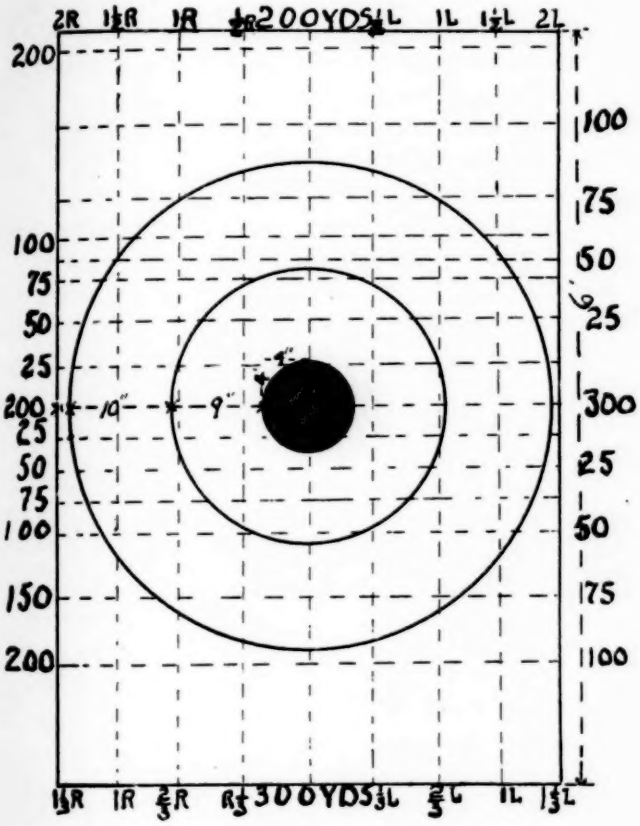


Correct method of aiming.

hand toward the body to tighten the strap and bring the butt firmly against the shoulder muscles. Glancing through the peep, with the rear sight vertical, bring the front sight accurately in its center, then keeping it there, raise the sight-tip to the bottom of the bull's-eye, 6 o'clock, leaving a white line for definition. Now holding the piece there, hold the breath and squeeze—slowly but firmly with the second joint of the index finger against the trigger till it goes off. The sight must be held on during the firing interval to insure a hit.

Suppose the pull was good at 6 o'clock but that the shot hit at the intersection of lines tangent to the top and left edge of the bull's-eye. It is 4 inches out both ways. Since one point of wind gives 12 inches at 200, knock on one-third of a point right wind, and lower the sight the width of a line. If this were the first

shot, it may have gone high on account of an oily barrel. Do not change then unless the second shot goes high likewise. Fire 10 shots there for instruction, then 10 for record—taking care to squeeze, not pull, the trigger.



Target "A."

Marginal figures show wind and elevation allowances to bring hit to the bull's-eye.

Top and left edges at 200 yards.

Bottom and right edges at 300 yards.

Now move to 300 yards slow fire and sit down at an angle with the target, feet well apart and braced. Change the sight-bar to 3x90 or 270 yards, and give about one-quarter of a point more

wind for the same flags. Take even greater care in holding and fire 10 shots for instruction, then 10 for record.

This completed, take the prone position, flat on the ground, feet well apart, at an angle of 60° with the targets. In both sitting and prone positions move the hand well out along the barrel and get the sling as tight as it can possibly be drawn. Since no sighters are allowed, use the elevation and wind just found. Fire five shots rapid-fire in 30 seconds, then five shots taking all the time necessary to insure perfect aim. These will be marked at the end of each string instead of after each shot as before. Thirty seconds is ample time to fire carefully, and the prone position gives an opportunity of making a high score.

Pistols will now be fired at 15, 25, and 30 yards—six shots at each range for instruction and six for record.

If qualified as marksman, a midshipman must make 40 at 500 and 40 at 600—and make a good skirmish run, to qualify. If this run with his marksman's course and rapid-fire pistols aggregates 894 he is a sharpshooter.

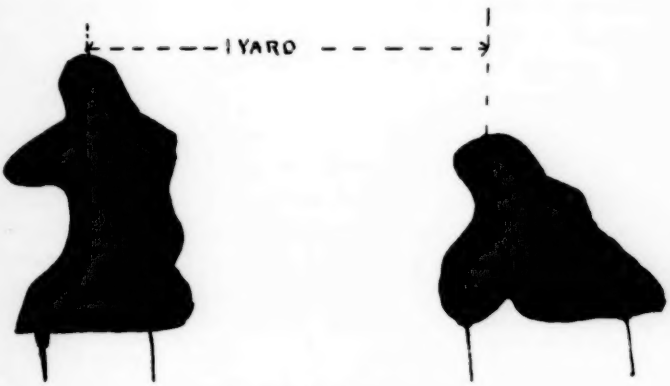
Five hundred and 600 yards are quite difficult ranges, requiring close observation of conditions. A good trick here is to get the sight correct for one set of conditions, fire as many shots as possible while they are steady, then if they change wait until they shift back again before finishing the string.

The skirmish run embodies all the principles above set down, and a few more. There are two shots at 600, two at 500, three at 400 and 350, and five from the magazine at 300 and 200. The time allowed is 30 seconds at all ranges except 200, where it is but 20 seconds. Sights are set first for 600 with estimated wind and the elevation previously found for slow fire. To get elevation for 400 yards take the mean of 300 and 500, then halve the difference between 300 and 400 to get 350 yards. The first command is "Fill and cut off magazine," at which five shots are put in the magazine and the cut-off turned down. This is followed by: "Forward, guide center, march, skirmishers, halt. Lie down."

"Fire two rounds at 600 yards"—at this command load from the belt, reserving the magazine for 300 yards. "At the targets"—aim carefully at the bottom of the big figure—"Commence firing"—"Cease firing"—"Forward, guide center, march"—then after 50 yards, "Double time, march"—at 500 yards, "Skir-

mishers halt." In this way the run is carried on from range to range.

Each man fires at a group consisting of a kneeling figure—the "squaw"—and a prone figure—the "papoose." The following points are essential: If you start with more than three-fourths of a point wind knock off one-fourth at 500 and then one-fourth at 400. For each range succeeding knock off one-eighth of a point. If starting with three-fourths or less knock off an eighth at every range. Set the sight in elevation for the next range before advancing at all ranges except 300. Fifty seconds are allowed before "Commence firing" at 200 yards to fill magazines and set sights. Do not fire until the last word of "Commence



Skirmish Targets.

Hit on prone counts 5.
Hit on kneeling counts 4.

firing" or the last note of the bugle, and get off all shots before the last note of "Cease firing." Failure to do this involves a penalty of five points. Watch the flags all the time for wind changes. Watch the dirt kicked up behind the target at every shot and hold or change so as to bring the splash behind the target. To verify wind, the first shot may be fired in the dirt at the figure's feet so as to make certain. Fire at the squaw at all except 200 and 300, and if uncertain of your elevations fire at it at all ranges. Make a mental note of ranges so as to get them accurately set for the next run. Hold hard and squeeze the trigger. Keep alert, taking every opportunity to defeat weather-condition changes, and success must surely result.

The above notes give an idea of the points of the game, but of course there are tricks at long-range shooting, many of which were used successfully at the National Match by the team.

The few points above will also serve to show the cause of the fascination that leads thousands of expert riflemen into competition every year. The sport is one of the cleanest of modern games, since it is a test of nerve, skill, and quickness rather than brute strength. What is more it is distinctly in the line of the profession, leading directly up to great-gun practice. To encourage it three medals are awarded to second-classmen for excellence, and sharpshooters' medals are given upon qualification. Once interested in it a man can easily understand the expression of a prominent navy rifleman, and an old Academy athlete, who declared that, outside of great-gun work, rifle shooting is the best of modern sports.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SPOTTING AND RANGE-FINDING.

By CAPTAIN BRADLEY A. FISKE, U. S. Navy.

There seem to be two opinions as to the best basis from which to find the correct sight-bar range in battle; one opinion being that the best basis is the use of a range-finder, and the other opinion being that the best basis is spotting.

In an article in the last number of the INSTITUTE, the present writer endeavored to prove that, even if spotting from aloft be the best basis for target practice in absolutely smooth water, it could not be used long in battle; and that the use of protected range-finders, *supplemented during the opening stages of the battle by an observer aloft,* is the only practical way of securing accurate sight-bar ranges in battle.[1]

The intention of the present paper is to point out briefly that even under peaceful conditions, and no matter what method, or what instrument, we use, the accuracy of the sight-bar range resulting must be strictly proportional to the accuracy of the method or the instrument used. Its intention is further to point out that no spotting "method" can be nearly as accurate as a range-finder, with an error less than one-tenth per cent per 1000 yards.

Probably no one will gainsay in words the statement that "no matter what method or what instrument we use, the accuracy of the sight-bar range resulting must be strictly proportional to the accuracy of the method or the instrument used." But does every one appreciate clearly what this means? It means that if we are to secure an accuracy of sight-bar range, which, for instance, with a target 6000 yards distant, will tell us within 36 yards how far a given shot fell short, the instrument or the method by which we

[1] Those who doubt the folly of failure to protect the important personnel as much as possibly can be done are respectfully referred to Captain Semenoff's "L'Agonie d'un Cuirassé." B. A. F.

do it must be capable of attaining that accuracy. If spotting be used, and the spotter be, say 75 feet above the water, then the method, or the instrument, which he uses must be such that he can ascertain accurately the difference between 5964 and 6000 yards; that is the difference between the angle subtended by 75 feet at 5964 yards and the angle subtended by 75 feet at 6000 yards—that is 6 seconds of arc. If he makes an error of 6 seconds of arc in ascertaining the size of this angle of 6 seconds of arc, he makes an error of 36 yards, *no matter what instrument, or what method, he uses.*

It hardly seems worth while to argue that no living man can ascertain any angle, big or small, with an error no greater than 6 seconds of arc, except with a mathematical instrument designed for that purpose. And therefore how futile must be any attempt to ascertain the correct sight-bar range at long distances by spotting, even in smooth water, except by continual trial and error; "up" and "down."

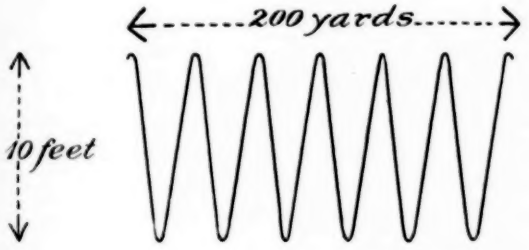
In the NAVAL INSTITUTE for September, 1906, in an article on the "Horizometer" by the present writer, is the paragraph: "It may be pointed out that the theory of spotting pre-supposes that the sea is absolutely flat, the water-line of a target a straight line, and the freeboard of the enemy's ship a constant quantity. But an extended series of observations at sea on a recent trip to Madeira, using the *Denver, Des Moines,* and *Cleveland* as targets, and using the horizometer as the observing instrument, showed that the mere height of the waves near the observed ship exercises a very disturbing influence on any attempt to estimate, or measure, the distance short of a distant ship that any point may be. The crest of a wave short of a distant ship is seen to be above her water-line and not below it; so that a point on that wave, such as splash made by a shot striking it, would seem to fall short, and yet the shot might be a perfect one; one that would have hit the ship, if it had not hit the wave. Furthermore, the bow or stern, when a long ship is pitching only a little, may rise and fall five feet each side of the horizontal; so that an absolutely perfect shot might go over it, or a poor shot might hit it. Any attempt to spot successive shots, and change the range by them under these conditions, which are normal and not abnormal, would produce confusion, and be impracticable."

This paragraph made the writer the recipient of some rather

harsh language in which was intimated, without unnecessary delicacy, that he did not know what he was talking about, and was a "back number" generally; that "practical experiments," carried on by a great many officers, had proved vertical spotting to be extremely accurate, etc.

In the last number of the NAVAL INSTITUTE, on page 292, the present writer showed the scientific inaccuracy of the usual "vertical spotting diagram," and pointed out that, although it purports

to be a scientific diagram, it is distorted, the vertical line being drawn to a scale about 30 times as great as that on which the horizontal line is drawn. On page 294 of the same article he showed the diagram, or a portion of it, as it would appear if correctly drawn, supposing waves to be 100 feet apart and 10 feet from crest to hollow.



The period of faith in vertical spotting seems now, however, to have passed away; but it has been succeeded by another faith which to the writer seems equally unpractical. The new faith seems to be based upon the Theory of Probability, which teaches that, if a number of shots be fired under the same conditions at a target at any certain distance, we can compute from the number of shots that go over, or short, or hit, the probable distance by which the range used was in error.

This is very plausible and appears at first sight to be very simple. But in the whole domain of mathematics there is probably no more complicated theory than the Theory of Probability. And the practical application of the theory to spotting is just as difficult as the theory itself. For instance, if we fire 8 shots at the water-line of the target, it seems very simple to say that, if four go above the water-line and four short, the sight-bar range is correct. But it is not necessarily *true*. For instance, the four shots that went above, might all have gone only a little bit above, while the four shots that fell short, might have fallen very far short; in which case it is plain that the sight-bar range was too short.

But *how much* was the sight-bar range too short? What shall we do about it? Evidently the problem is indeterminate. We have not sufficient data to start from. If the four shots that went over, went over by exactly the same amount, and if each of the four shots that went short, went short by exactly that amount, we should feel warranted in concluding that the sight-bar range was correct. That is we would feel warranted, *if* we knew that all the shots that went over, went over by the same amount, and *if* we knew also that each of the shots that went short, went short by that amount. But we have no means of knowing those things.

In other words, even if a method be employed, instead of an instrument, the method cannot lead us to *accurate* results, unless some *instrument* be employed besides by which we can *measure* the amount by which shots go over or short. *If* we could fire an infinite number of shots, it is true, no such instrument would be needed; because, supposing the shots to be fired under the same conditions, the probability would be a certainty that the average distance by which the shots went over would be exactly equal to the average distance by which the shots fell short. Even if we fired only a thousand shots, the method would probably be sufficiently accurate for the purpose of gunnery at sea; but where only a small number can be fired, it seems hardly worth insisting that the method must be supplemented by some instrument which will measure the amount by which the shots fall short or over: that is, if we wish to lose as few shots as possible.

In other words, the method proposed is not a scientific one, under the conditions; and even if the weather be fine and the sea smooth, it cannot be made even to approximate accuracy, because the number of "events" that can be utilized must of necessity be

too few; too few even to permit the method to be classed logically as coming under the Theory of Probability, because it does not permit the *degree of probability* to be known. The reason why it appears so good at first sight is simply because it is so crude that only large errors show out clearly. Imagine any one trying to tell by this method the difference between 5964 and 6000 yards!

It has been said that the use of range-finders has two disadvantages as compared with spotting.

These two alleged disadvantages are:

1. That a range-finder is not strong enough to resist the shock of discharge of guns, especially if it is placed on a turret. To this objection it may be answered:

(a) On April 15, 1907, in Chesapeake Bay, five 12-inch shells were fired from the turret of the *Arkansas* and the range-finder mounted upon the turret was not harmed or disadjusted in the least. It gave the same indications of distance of a lighthouse after the shots were fired as it did before. The lighthouse was about 6300 yards distant.

(b) The objection that any proposed appliance is "not strong enough" is the silliest objection that can be made against it, unless it is proved that the appliance cannot be made strong enough. It was this same miserable objection that held back the use of what we then called "mechanical gun carriages," telescope sights, prismatic telescopes, and all electrical appliances for so many years. Everybody knows that almost every new appliance ever introduced into the navy has had to be made stronger than it was originally; and that there is probably not a single officer in the navy who, if given the job of making any given range-finder strong enough to withstand the shock of guns, would fail to do it.

2. The second objection is a very sensible one. It is, that the vibration going on in a ship during a battle would be so great that no range-finder could be used. It is perfectly true that for two or three seconds after the discharge of any gun, a range-finder, even if at a different part of the ship, will show such dancing images that no reliable range can be read. The writer found this out on board the *Maine* in 1903; but the reason why these images dance is not because the instrument which shows them is a range-finder, but because the instrument is an optically-magnifying instrument. Any telescope of equal magnification shows images that dance as much. This is optically a necessity. The reason

why we notice the dancing more in a range-finder than in a telescope is simply because the images are so aligned as to make us detect it.

But in reality the same difficulty exists if we attempt *accurate* spotting. In order to make a spotting method *accurate*, we must use aloft *instruments* (not telescopes) of considerable magnifying power, so as to detect small differences in range; that is small vertical angles. If the observer be 75 feet high, then the magnifying power of the instrument used, whatever it is, must be as much as one-fifth of the magnifying power of a range-finder of 15-feet base, because its base line is five times as great. If the water were absolutely smooth, and the water-line of the target ship as precisely defined as the top of a mast of a ship which a range-finder ordinarily uses to sight on, then, supposing the instrument used for spotting to be constructed on an equally scientific principle, its indications would be equally accurate.

Now, as such an instrument would be only one-fifth of the magnifying power of the range-finder, it would be affected only one-fifth as much by equal amounts of vibration. But the vibration on a mast 75 feet above the water-line is at least five times as great as the vibration on the top of a turret, which is perhaps the solidest structure in the world.

So it seems that if an instrument, or a method, were invented as accurate as a range-finder, for use say 75 feet above the water, it would be no better than a range-finder, even if the sea were absolutely smooth and the water-line of the target ship were as sharply defined as the upper part of a mast against the sky. But the sea is never smooth, and no water-line can possibly be as accurately defined as the mast of a ship. Besides, in wartime every captain will make the water-line as deceptive in appearance as he can; or ought to do so.

Inasmuch as any instrument, or any method, for finding a sight-bar range must be unfavorably influenced by vibration and other causes, it is plain that, to insure accuracy, there must be occasional, perhaps frequent, "cease firings," in order that the sight-bar range used may be verified. The frequency of these "cease firings" will, of course, depend on the conditions at the time, and principally on the rate of change of range.

It may be objected that instruments which show correctly the rate of change of range will enable us to use the correct sight-bar range indefinitely, after it has once been ascertained.

No; because, while such instruments are very accurate, *per se*, *they depend on spotting*, and *on a more or less accurate estimate of the course and speed of the enemy*, both for their original setting and their later corrections. If the spotting should indicate, *rightly or wrongly*, that the shots were falling short, we would correct our sight-bar range, no matter how much confidence we might feel in the rate of change of range instruments, or in our estimate of the course and speed of the enemy.

The essay of Lieutenant-Commander Stirling in this number of the INSTITUTE shows with perfect clearness how easy it will be to fool the range projector, by changes of course too small to be detected.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NOTE ON THE PROBABILITY OF GUN-FIRE.

By Lieutenant A. Mazzuoli, Italian Navy.

(Translated from the Revista Marittima.)

It is usual to give in Range Tables the values of the heights and breadths of the 50 per cent bands as determined at the proving ground, the probable vertical and lateral deviation being deduced by the ordinary methods of the theory of errors from an experimental group of rounds. The chance of hitting a target-band of given height or breadth can then be obtained from the Table of Probability Factors by means of the ratio (probability factor) between the dimensions of the target-band and those of the 50 per cent zone. It is usual, moreover, to adopt as the value of the width of the band that contains all hits, four times that of the 50 per cent zone; because from the Table of Probability Factors it appears, that to the factor 4 corresponds, for the chance, the value 0.99, very nearly unity. Now the above procedure gives results which do not generally tally with those obtained experimentally, and the difference increases with the reduction of the number of rounds of the experimental series considered. I deem it therefore useful—limiting myself to the above-mentioned case, a very important one for practical purposes, of finding the ratio between the *greatest* deviation in a group of hits and the *probable* deviation of the same group—to expound the results of many observations made, together with some remarks dealing with the same.

The average value experimentally obtained of the ratio between the width of the zone that contains all hits, and that of the 50 per cent zone, in a considerable number of series and for a different number of rounds in each series, is given in the following table

deduced from the experimental results obtained from a large quantity of groups of rounds fired at the proving ground of Viareggio.

TABLE I.

Number of rounds in each series.	Number of the experimental series considered.	Value of the ratio between the width of the zone that contains all hits and those of the 50% zone.
(a)	(b)	(c)
3	116	1.50
4	65	1.73
5	40	1.95
6	40	2.03
8	98	2.24
10	25	2.45
12	20	2.58
14	20	2.59
16	20	2.63
19	20	2.78

In spite of the fact that the above values (column c) have been deduced from a considerable number of trials (column b), it would be natural to hesitate before definitely accepting as reliable the empirical law they show forth, and applying it to practical purposes.

It is therefore specially interesting and important to seek some possible relationship between the said values and theoretical deductions. The following remarks can be made on the subject:

Calling E the 50 per cent zone and p_k the chance of hitting, with a single shot, the band kE, then $1 - p_k$ is the chance of a single shot missing; and, therefore, in n rounds, the *probable* number of hits outside the kE band will be $n(1 - p_k)$, an expression which increases with the increase of n; which is the same as to say that the width of the zone, that probably contains all hits, increases together with the number of hits.

Now it appears right to hold that, in a series of n rounds, the dimension of the band that contains them all, should be approximately determined by the value of k, given by the following formula:

$$n(1 - p_k) < 1.$$

Calculating, according to the aforesaid criterion, the values of

k for the values of n of column (a) of the preceding table, one obtains:

TABLE II.

For $n = 3$	$k = 1.46$
$= 4$	$= 1.73$
$= 5$	$= 1.91$
$= 6$	$= 2.05$
$= 8$	$= 2.28$
$= 10$	$= 2.44$
$= 12$	$= 2.58$
$= 14$	$= 2.68$
$= 16$	$= 2.77$
$= 19$	$= 2.88$

The comparison between these values of k and those given in column (c) of Table I shows how the criterion above expounded has a really noteworthy practical confirmation, the differences being very small or non-existent in the greater number of cases, and only somewhat noticeable for the greater values of n, for which, however, the experimental values of k would require a further confirmation; because the greater the number of rounds in a series the more likely it is that the conditions have changed, with consequent perturbation of the results as compared with the deductions to which the theory of casual errors leads. Consequently, there is need for a very considerable number of tests, so that such perturbation also may enter within the scope of the laws which regulate the casual errors, viz., should on the average compensate one another.

It seems, therefore, plausible to conclude that, at least while the number of rounds of a series is contained within the limits considered in this paper, the values of k given in Table II may be legitimately held as the most probable values of the relative width of the band that contains all the hits of the series.

An important practical application of the above presents itself when one wishes to establish the order of merit of gun-layers in a firing competition, in relation to the number of hits on the target; in which case it is necessary to consider also, so as to assure the greatest possible accuracy, the number of rounds each gun-layer is allowed to fire. For instance, in firing with a 6-inch gun, full-

charge, A. P. shell, at 3000 meters, the 50 per cent zone being mt. 2.65 in height, the height of the target containing all hits should be assumed at mt. 3.87, if the number of rounds to be fired be 3, at 5.43, if the said number be 6, and at 6.84, if it be 12. It is clear that the difference between these values is anything but insignificant.

It should be noted that in the above example the width of the band containing all the n hits of the series has been referred to the similar dimension of the 50 per cent zone given by the Range Table and therefore obtained from a number of hits often different from n. This, however, makes no difference theoretically, whilst also the comparison of the mean values of many experimental data shows that the values of the probable error obtained from series differing in number of hits may, within the limits of approximation necessary to us, be considered equal.

NOTE.—In confirmation of the results above set forth, the Superintendent of Experiments at Shoeburyness, Major A. C. Currie, writes to the author that he has tried his factors in many ways and found a wonderful agreement with the experimental data. Taking longitudinal errors, with new guns and with worn out guns, having errors ranging from 10 yards to 750 yards, his results were as follows (using same headings as in Table I):

(a)	(b)	(c)
5	33	1.92
10	61	2.39

Similarly, with lateral errors and with variations of muzzle velocity, he found experiment closely agreeing with the above deductions.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

RECENT CHANGES IN BRITISH MESSING AND CANTEEN METHODS.

By Paymaster George P. Dyer, U. S. Navy.

The very interesting changes recently made in the King's regulations governing the British navy, and put into full effect on January 1 of this year, concerning the subsistence arrangements in that service, ought to be accessible to every officer of our navy who is interested in this subject. The issue of these regulations followed as a result of the report of a special committee appointed by the Admiralty, to investigate the complaints concerning the victualling and canteen arrangements then existing, and to recommend advisable changes.

This committee was headed by Rear-Admiral Spencer H. M. Login, who had evinced great interest along similar lines, and had instituted some admirable reforms, while on duty at one of the large yards.

It is not surprising that this committee should have been appointed when we consider what the messing system was, which called for its scrutiny. In the first place the crew was subsisted through separate messes, each run by its caterer, as formerly in our own service. A very restricted ration as to variety—cost, about 20 cents—was issued. But if not all drawn, the value of "the savings" was credited to the mess. Purchases of provisions in excess of the ration on any item were not allowed. So that an anomalous situation was presented when a mess, needing more tea, coffee, sugar, etc., as it usually did, was compelled to buy them from the Maltese merchant, running the ship's canteen, at higher prices for poorer quality. Few ships were fitted with facilities for baking bread; and a compulsory issue of biscuit one day a week, was required. None of the modern cooking devices, known in our service, were in general use.

Under such a system the canteen must necessarily be used as an aid to the government in feeding the ship's company, and so must be considered in connection with any changes contemplated. In addition it appeared that there was widespread criticism of the laxity and want of uniformity in their administration. Of three plans for a canteen, the most usual was to permit its establishment on board, by a contractor who furnished his own help, and fixed his prices under the direction of the captain, and with the approval of a Canteen Committee. Such a tenant paid rent, and furnished free table-cloths, plates, and basins, to the messes, and looking glasses for the use of the crew. The rental paid was used as a ship's fund for the benefit and amusement of the men. With competition amongst contractors for the privilege of conducting the ship's store, with award to the one willing to pay the largest rent and with the inevitable lax supervision of the ordinary Canteen Committee, it is no wonder that there was complaint of prices and quality, as well as of other abuses due to the unscrupulous methods of contractors.

The committee, after its very exhaustive investigation, including consideration of reports from 194 ships, and the evidence of nearly 70 naval witnesses, besides that collected from contractors and visits of inspection, could scarcely fail therefore to report that radical changes in existing conditions were necessary to bring them up to date.

The report which follows in elaboration of these opinions is a very able one. It should be borne in mind, however, upon what premises its conclusions were based, before being fitted to our own conditions. With regard to subsistence the committee framed its recommendations on the prevailing system of individual messes. This presupposes the existence of a canteen as an aid to the caterers in supplementing the government ration, and providing a varied bill-of-fare. The committee further confined itself to the limits of cost of the existing ration (about 20 cents) in suggesting an improved table of ration components, as each penny increase per ration in the British service amounts to a charge to the government of nearly $750,000 a year.

While limiting itself to conservative suggestions, not involving a change in the traditional system of individual messes, the committee could not forbear, in view of its investigation of conditions in our service, and the methods employed in feeding large numbers

of persons on merchant passenger steamers, to outline its ideal. It is satisfactory reading to Americans to find that this is a fairly accurate description of our general mess system. The committee says that if such a scheme were instituted, "it might be possible to advance within a few years (in the larger classes of ships) to a system under which the ship's company will be completely catered for by a trained commissary steward, and a proper staff of cooks under the general supervision of the paymaster." It proceeds to state that with such a system no need would exist for the payment of any cash allowances but that the general mess would be "provided with cooked meals ample in quantity and as varied as possible, up to the value of the ration." Further, that the following are essential to the success of any such system however: "(1) A thoroughly competent commissary steward and staff of cooks and bakers. (2) Up-to-date cooking appliances. (3) Adequate cold storage accommodations so that a ship arriving in port after an extended cruise would be able to provide as good a bill-of-fare on that day as she did on leaving her port, say a week before. (4) A free hand within reasonable limits to the officer in charge of victualling." These revolutionary doctrines are, as stated, too radical for general use, but the committee recommends that a general mess combining these essentials be instituted on the *Dreadnought*. The Admiralty approved this suggestion and already favorable reports are being received of its operation on that vessel and on several others on which the newest plan was tried. Amongst these are the *Furious*, on which a general mess, started independently, has been running with great success for the last six months, with a first class petty officer acting as caterer, under the interested supervision of the executive, Lieutenant Garforth.

Of course, the general mess scheme will be a success in the British service, as it was in ours, but we may plume ourselves without sinful pride on having been well to the fore in this phase of naval administration.

With regard to the canteen the committee in its recommendations considered it only as an adjunct to the mess. Its additional function as purveyor of articles of convenience, other than provisions, is merely referred to. With us the general mess system practically provides for all requirements in the way of food. Leaving the canteen to supply only food articles of luxury; and those

needed items of convenience which the government does not carry in stock.

We can now take up various interesting details of the report of the board, which was substantially accepted in toto by the Admiralty. In defining its conclusions the committee made the significant statement that it had "been much struck by the unanimity with which it is now recognized in the service that the cooking question, the canteen question, the victualling question, and the savings question are all parts of one great problem—namely, that of the proper feeding of the ship's company—and that all these sections of the problem must be dealt with simultaneously, if any real progress is to be made. The committee's inquiries lead them to endorse this view, not, perhaps, very clearly realized in the past, and they desire to lay stress on the fact that the success of their proposals must depend on attention being paid to all these questions simultaneously. The question of good cooking and adequate cooking appliances is, in many respects, the most important of all."

The interrelation here indicated of the various elements resulting in placing the most satisfactory food at the lowest cost upon the men's tables has only recently been recognized in our own service. We cannot expect to approach ideal mess conditions until we realize that all the efforts put upon the procurement of our provisions, to secure the maximum of variety and quality, must be equalled by those devoted to their preparation and service. A cooking school has recently been established at Newport from which great things may be hoped. Thus, the second element of the trio—food procurement, preparation, and service, is receiving long needed attention. It is to be hoped that the third also will be taken up, in the near future, through the addition to the course given every recruit, of a brief, but careful, training in the duties of messman, under the eye of a special instructor. Dealing with then existing defects the committee reports that throughout their inquiries they found stress laid on the fact that there was little or no room for complaint in regard to the official victualling on the ground of quality, the real defect in the government ration being its inherent monotony. A further defect in the system was its want of elasticity, which prevented the men from taking full advantage of the excellent quality and cheap price of the government provisions. They also found a widespread opinion in the service that the savings system, as then existing, was cumbrous

because of the inability of caterers to know how their messes stood until the end of the month. These defects, they considered, could be remedied with great advantage, both to the men and the government by the following changes: "(a) A standard government ration (value approximately 6 d. per diem) together with a messing allowance of 4 d. per diem to take the place of the present official ration (value approximately 10 d. per diem), and of the savings system. (b) The messing allowance to be available, not only for expenditure on luxuries in the canteen, but also for taking up government provisions on board in addition to the standard ration."

There is no doubt that a standard ration tends towards monotony and inelasticity in the bill-of-fare, especially when as restricted in its issue as the former British ration. The committee admits that the ideal system for variety is the one under which steamship companies feed their passengers. These set a money limit on the total cost of subsisting each person, and leave the question of the proportion to be spent on each item, to the caterer. Of course such a system disregards all dietetic considerations, does not have to take into account military conditions, and so cannot be applied without modification to a warship. It is probably more nearly approximated, however, in our service than in any other, through the liberality in quantity, and the wide range of substitution allowed by our ration laws. A comparison of the present American and British standard rations with substitutes will repay perusal as will one also of the fixed prices of issue set for the items of the British ration, with their average cost to our government at New York. Almost immediately after the new ration was put in operation at home ports, a defect was discovered which led to serious criticism. It appeared on ships at these ports, where many of the men were regularly given over Sunday liberty, that the compulsory issue of rations provided too much food for those remaining on board. As one paper described it at the time, "The result of the compulsory bread ration on Sunday has been to line the beach in the vicinity of harbor ships, or fill the refuse carts in the dockyards with stale loaves, very much to the monetary detriment of the fleet-man." This objection was met by the Admiralty with the issue of a regulation permitting the commutation of the rations in such a case, on Sunday, for 9½ d.

The only other objection that the new system seems to have met,

U. S. NAVY RATION.			BRITISH NAVY RATION.		
USUAL COMPONENTS.	SUBSTITUTES.	Price (N. Y.) per pound, gal., or doz.	USUAL COMPONENTS.	SUBSTITUTES.	Fixed Price per pound, gal., or doz.
No money allowance			**4 pence, as messing allowance**		
1¼ lbs. Fresh Bread		.035	**1 lb. Fresh Bread**		.02
	1⅛ lbs. Flour	.03		1 lb. Flour	.025
	1⅛ lbs. Cornmeal	.017		——	——
	1⅛ lbs. Oatmeal	.025		¼ lb. Flour, ¾ lb. Bread	——
	1 lb. Biscuit	.055		½ lb. Biscuit	.03
1¾ lbs. Fresh Meat, Fish or Fowl	av'ge	.08	**1 lb. Fresh Meat**		.08
	1 lb. Preserved Meat	.09		6 oz. Preserved Meat	.12
	1¼ lbs. Salt Pork	.10		½ lb. Salt Pork	.14
	1¼ lbs. Smoked Meat	.15		——	——
	8 Eggs	.21		——	——
1¾ lbs. Fresh Vegetables		.015	**1 lb. Fresh Vegetables**	av'ge	.02
	¾ lb. Tinned Vegetables	.055		½ lb. Potatoes,* with ¼ lb. Split Peas, Celery Seed	.01 .03
	5 oz. Dried Beans (.041), or Peas (.03)			1 oz. Tinned Vegetables,* with 8 oz. Flour, ¾ oz. Suet and 2 oz. Raisins	.12 to .18 .12 .08
	½ lb. Rice (or other starch food)	.067		2 oz. Haricot Beans* (or Marrowfat Peas) with 4 oz. Rice	.05 .05 .04
	¾ lb. Flour			[* Interchangeable.]	
	6 oz. Dessicated Vegetables				
9 oz. Fresh Fruit (with tinned, salt or smoked meat ration only).	av'ge	.04	**1 oz. Jam or Marmalade**	——	——
	8 oz. Canned Fruit	.08			
	5 oz. Dried Fruit	.10			
1/2 oz. Tea		.215	**1/2 oz. Tea** }		
	2 oz. Cocoa	.16	**1/2 oz. Cocoa** }	3 oz. Coffee	.16
	2 oz. Coffee	.085		——	——
	——	.046	**4 oz. Sugar**		.08
	4 oz. Sugar	.08			

9 oz. Fresh Fruit (with tinned, salt or smoked meat ration only).	6 oz. Canned Fruit 3 oz. Dried Fruit	av'ge .04 .02 .10	**1 oz. Jam or Marmalade**	**4 oz. Rice** [* Interchangeable.]	.04
1/2 oz. Tea		.215	**1/2 oz. Tea** }		
	2 oz. Cocoa	.16	**1/2 oz. Cocoa** * }	3 oz. Coffee	.16
	2 oz. Coffee	.085			
4 oz. Sugar		.046	**4 oz. Sugar**		
1 oz. Condensed Milk		.11	**3/4 oz. Condensed Milk**		.08
	1/8 pt. Fresh Milk	.05		**3/4 pt. Fresh Milk**	
2 oz. Butter		.305	**No Butter**		
No Spirit ration			**1/8 pt. Spirit**	1 d. (in cash)	
Yeast (or Baking Power) and Flavoring Extracts as required			**Mustard, Pepper and Salt as required**		
Weekly allowance:			*Weekly allowance:*		
1/4 lb. Tinned Tomatoes		.05	**4 oz. Preserved Meat** one day per week in port and two days per week at sea—for cruising ships only.		
1/4 lb. Salt		.01			
1/32 lb. Pepper		.18			
1/32 lb. Mustard		.135			
1/4 lb. Macaroni	[NOTE: In addition to the specific substitutions allowed, act approved March 2, 1907, authorizes substitution of any article for another up to *value* of articles for which substitutions are made.]	.05	Slight additional allowances of food to boys under training, and for issue to all hands in wartime or in emergency.		
1/4 lb. Cheese		.17			
1/4 lb. Pickles or Kraut		.05			
1/128 lb. Spices		.29			
1/2 pt. Vinegar or Sauce		.15	For night watches, or for men on extra heavy work, coaling, etc., 1/4 oz. Sugar, 1/2 oz. Coffee or Cocoa (or 1/8 oz. Tea), 8 oz. Bread and 6 oz. Preserved Meat.		
1/4 pt. Sirup		.31			
7 lbs. Lard to every 100 lbs. Flour		.11			
For "night steaming watches," 1 oz. Coffee or Cocoa, 2 oz. Sugar, 5 oz. Bread, and 4 oz. Preserved Meat.					

has been that the issue prices of government provisions were excessive, but this was to be expected in view of the better quality of these over the usual grades sold by the canteens; and no action was taken.

Perhaps the most important observations of the committee with regard to separate items are those devoted to the traditional navy biscuit. Its remarks on this subject will probably be most heartily assented to in our service: "We feel strongly that the time has arrived when it should be recognized that hard biscuit is not a palatable substitute for bread, except in absolutely the last resource, and that every effort should be made to make better provision for the ship's company on these occasions . . . ." Having inspected samples of the biscuits issued in the United States, French, German, Russian, and Italian navies, we are unable to describe any of these as markedly superior or more palatable; nor are we prepared to contest the statement made by a Committee on Navy Rations in 1901 that 'from a dietetic point of view the service biscuit cannot be improved upon.' But there is no doubt that, for one cause or another, this article is thoroughly unpopular with the men, and that there is a strong desire for the introduction of a biscuit more of the type used by the army and the leading steamship companies. . . . . The existing stocks of the present type of biscuit could be used for issue to men under punishment."

Accordingly the new regulations require that men "in cells," on what is aptly termed "low diet," shall be provided with one pound of biscuit only, daily. One recommendation of the committee was that small numbers of men sent away on detached service, on short notice, and unable to take their dinners with the mess, may obtain provisions to the value of 12 cents, to take with them. I am afraid that detached duty would not be much sought in our service at this rate! To the British though, who have never had any allowance for steamers' crews, etc., it comes as a boon.

On one point, however, we can take a leaf from the British bluejackets' book. The King's regulations direct that watch-keepers should relieve after meals, instead of in conflict with them, as generally in our service, where the practice is to advance the preparation of the meal for the entire ship's company to accommodate the "early eaters," who have to go on watch. There is nothing that tends more to reduce the palatableness of the food cooked for the general mess than this practice. The committee reports that

these regulations are entirely satisfactory, and recommends that they should further be strengthened by prohibiting early issues from the galley. "The inconvenience suffered by a small number of men should not be made the excuse (as is often the case) for a large number of dinners being spoiled; or for men being tempted to leave their work on deck."

"Officers have their ration commuted at the rate of 10 d. per diem. While commissioned warrant officers, and warrant officers, as elected by the mess, may receive commutation at this rate, on a standard ration in kind."

The Canteen.—I cannot do better than quote the opening remarks of the committee on the subject of canteens as equally applicable to any navy, and as defining the function of the canteen as purveyor of articles of convenience, as distinguished from necessaries.

PART II.—CANTEENS.

GENERAL REMARKS.

124. *Introductory Remarks.*—The committee feel that the canteen system has grown to undesirable proportions, and consider its reduction to more wieldy dimensions as of the greatest importance. The proposals we have made on the lines of avoiding the duplication of stocks on board ship will, we consider, prove a first step in this direction, and, as more experience is obtained, we see no reason why other articles in daily request (as opposed to luxuries) should not be withdrawn from the canteen stores and supplied on repayment by the government.

125. *Necessity for Canteens.*—With a right relation established between the service victualling and the canteen, it will be a matter of comparatively little moment in war time whether circumstances admit of the continuance of a canteen or not. We do not, therefore, propose to recommend any special arrangements in regard to the continuance or otherwise of canteens in time of war. At the outbreak of war there will be a certain canteen stock on board, and subsequent replenishment or otherwise must entirely depend on circumstances.

126. *Canteens should be Officially Recognized.*—The committee are unanimously of opinion that in time of peace some form of canteen will always be necessary on board a man-of-war for the comfort and convenience of the ship's company, and that the necessity for its existence should be officially recognized.

It is undoubtedly true that as an agency productive of contentment, on board ship, a well-run canteen is invaluable, and though its function may be temporarily suspended during stress of war, that it should normally be an officially recognized element in the ship's administration. To reach its greatest utility the canteen

must sell practically at cost, and must be sufficiently elastic in the matter of stock to conform to local or temporary changes in demands upon it. The latter can only be accomplished through allowing the active manager wide discretion in the direct purchase of stores, other than those standard articles which are in constant demand, and which can be bought in sufficiently large quantities by the central authority to issue to the ships at a material saving in cost.

The advantage in prices to be realized, however, is chiefly through the lack of necessity on the part of the canteen to bear the expenses of administration, such as rent, delivery, advertising, and other charges necessary to the ordinary shop.

The committee states that if a general mess system could be started, and the canteen relieved of its function as a necessary agent in the supply of provisions, it would still be required as a shop for sundries. Such as we find so convenient upon our vessels. This, the committee says, would be of small dimensions and could either be run as a ship's canteen (that is, like our present ship's stores) or let to a tenant; the profits in the former case, and the rent in the latter going to form a ship's fund, and that contracts should also be made at the chief ports of call for the supply to these canteens of articles not stocked by the government.

For the present uses of the British service the committee recommended that practically all canteens be established on what is known as the "tenant system," brought under centralized observation and given uniformity to correct its present abuses. This was done by the Admiralty in the appointment of a "Commander for Canteen duties," to collate all information necessary to guide commanding officers. In the selection of proper tenants from the official list of accepted bidders for this business and to facilitate the introduction of the new system generally, a standard form of contract is provided for all tenants based upon the payment of rental in proportion to the complement of the ship. From $250 per annum for vessels with two hundred and fifty men to $2000 for those of eight hundred. "The tenant shall supply and pay, an adequate staff to issue goods, man his boats, etc., and for the good behavior and trustworthiness of his staff he shall be absolutely responsible. . . . . The manager and canteen staff shall be victualled by and at the expense of the tenant."

In the face of these conditions it is hard to see how the com-

mittee, actuated as it was by interest for the ship's company, could decide upon such a system in preference to the official canteen recommended by about 30 per cent of the commanding officers and men who recorded their opinions. This, in spite of the fact that never having been tried, the official canteen had none of the prestige of tradition to influence the vote. To be fair to the committee and let the reader judge, I will give its reasons in its own words: "The committee, however, do not recommend the adoption of such a system (i. e., an official canteen). In expressing this opinion we have given full consideration to the arguments brought forward in its favor; e. g., elimination of contractor's profit, and possible advantages of quality and price through utilizing government facilities, for purchase, storage, distribution, etc., on a large scale for the whole fleet. In our opinion the advocates of this system have given insufficient thought to the difficulties of conducting it, on any lines that would both protect the Crown against loss, and preserve to the ship's company the same freedom of choice that they now enjoy, nor do we believe that the latter would be permanently satisfied with the very minor measure of control that would necessarily belong to them under any system of government canteens. . . . . The paymaster should issue on repayment staple articles (i. e., government provisions) in daily request by the messes as opposed to the luxuries which the ever-changing tastes of individuals demand. With regard to the latter, it is not to be expected that the individual tastes of the 'lower deck' would be so well catered for by an official organization, as by a contractor, whose only hope of making his business a success depends upon his readiness to meet every whim and fancy of his customers. Nor must it be forgotten that the conditions under which the government buys and sells practically deprive it of any outlets for articles which go out of favor, or which otherwise become surplus, whilst all large firms of caterers possess such outlets, and depend upon them for minimizing their losses." In reaching this decision it appears to one individual at least, that the committee surrendered the possibilities of theory to the certainty of experience. A proper tenant canteen may be all claimed for it, and still be bettered by the official one. There is no reason, in theory, why just as much elasticity may not be given to the latter as to the former, or why it should not be just as efficiently run. If this is so *means can be found to make it as efficient*

in practice. With all the advantages of a system such as the government could confer with the facilities for purchase, storage and distribution, it would take a wide difference in efficiency, indeed, to compensate for the cost of a tenant, when besides his profit he must cover the entire expense of his organization, requiring a gross profit of at least $3000 or $4000 during the year. This does not consider rent (which on a battleship would equal another couple of thousand), because this is returned to the men, though at the expense of the cardinal principle, that the only true satisfactory distribution of the profits of a store run on mutual lines is through giving each purchaser at the time the maximum benefit of his particular purchase in the lowness of its price. Undoubtedly, the tenant system has its vital inherent defect. The interest of the owner is, and must necessarily be, diametrically opposed to that of the ship's company. To charge as long prices as he can, to tempt men to buy things they do not want, to increase his sales, and in turn to be tempted to sell forbidden articles, are all expressions of this weakness in the system. I fear the committee is too sanguine in believing that even the closest scrutiny and supervision will rid it, in the future, of the abuses to which it has been subject in the past. However, with the " ship's store " for the sale on board of government provisions, established by the recent changes, the tenant system will have a chance to prove its worth in a comparison of methods. Let us venture the prophecy that not many years will pass before it will become evident that the canteen should be merged into the " ship's store " so that the supply of all articles needed by the crew may be furnished over one counter and in the interest of the men, wholly under government auspices.

DISCUSSION.

A Few Hints to the Study of Naval Tactics.

(See No. 125.)

Comdr. H. S. Knapp, U. S. Navy.—It is a healthy sign to find naval tactics the subject of the prize essay. Up to a recent time ours has been a single-ship navy, and it is necessarily an evolution to rise from thinking in terms of a single ship to thinking in terms of fleets. That evolution is well started, however, and papers like the prize essay will help it along. It is particularly gratifying to find that the essayist is an officer of a junior grade, for the hope of the navy rests in the coming generation.

If the following remarks in discussion seem generally to be in disagreement with positions taken by the essayist, I am sure he will welcome them just the same as an honest effort to reach proper conclusions on so important a subject.

The essayist's definition of "exact column" (page 2) is, to my mind, too inflexible, and the following expresses my conception better (the word "exact" should be eliminated as unnecessary). Column is that formation in which ships follow after the leader, each in the wake of its next ahead. By this definition the line of bearing may be a broken line, or a curved line if the leader makes continuous slight changes of course. In this latter case there is a very general failure to realize how slight the curvature is. With a 6000-yard battle range, two fleets of sixteen ships at 400 yards distance engaged in a parallel column fight, the speed of one fleet 20 per cent greater than the speed of the other, the slower steadily but very slowly changing course to keep the faster from capping, the faster doing the same thing to hold the range—under these conditions the slower fleet occupies about 11.5° of arc on a circle of 30,000 yards radius, in other words the rear ship has the leader about one point on the bow. With such a slight curvature and that number of ships, any evolution can be performed that can be done from the so-called "exact column" having a straight line of bearing. As a matter of fact the essayist seems to have the same idea of column as myself (in the last line of page 3 and the two first lines of page 4), but it does not agree with his definition, nor with the definition to be found in authoritative publications, and this is why the matter is noted.

With the essayist's general conclusions about the merits of column, line and line of bearing there will probably be little dissent. In column the leader is responsible for the course and the maintenance of uniform speed. The rest have only to follow on and keep distance; they need no compass. Slight irregularities in steering become apparent at once, and correct themselves. Distance is easily kept without instruments by reason of the depth along the line of vision occupied by the ship ahead, and the many vertical objects in range along that line—masts, ventilators, bridges and smoke-

stacks. In line every ship must keep the course, preserve the distance, and preserve the line of bearing. Slight irregularities in steering are not at once apparent, and ships can get considerably out of position before the fact is noticed. Distances are hard to judge without instruments when looking broadside on to the guide. A compass in use on every ship is a necessity to keep any line of bearing whatever—except column. It is even more difficult to keep a good formation in "line of bearing" (echelon—it is a pity to drop the use of a word so fixed in our nomenclature) than in line. To change course in line or line of bearing, or to get from them into any other formation, requires either a simultaneous movement, involving signals, or else a change of speed. Change of speed is never necessary in column except to open or close distances; and changes of course need no signal, not even the whistle if the fleet is well trained. The advantages of column that have just been mentioned refer solely to station keeping; when to them is added the yet more important advantage of greater volume of fleet fire, the case in favor of the column seems to be proved.

The essayist commends line and line of bearing, and condemns column, for the approach. In general I agree, but with some reservations. First the period of approach should be defined as the period from the time hostile fleets know of one another's whereabouts until they reach effective range. When once within effective range, the period of action begins. Retreat and pursuit are phases of action; approach is antecedent to, but is not properly speaking a phase of, action. Using the term "approach" in this sense, and it seems the proper one, there is no apparent reason why any formation should not be used—fleet column, column of squadrons or divisions, line, line of squadrons or divisions, or line of bearing. The only limitation is that the fleet should be in column, heading approximately at right angles to the bearing of the enemy, when it comes into effective range. If two fleets were to head directly for one another, or nearly so, as soon as they knew of one another's proximity, line or possibly line of bearing would be the natural way of approach. But there will probably be a deal of maneuvering for position, miles out of range, and it may be that one fleet will never go out of column, leaving to the other the maneuvering during approach. The weather vantage and sun gauge are worth trying for, although this is not always done in battle maneuvers; and while there may be exaggeration in the statement made in these pages some years ago that fleets may maneuver for days before getting into action, yet I believe that it is nearer the truth than the idea so often implied, if not expressed, that fleets are going to rush madly straight upon one another as soon as they get within sight. My reservations are made more to bring this out than for any other reason. Toward the end of the approach, if a fleet is itself trying to close with the enemy, I agree with the essayist that it should be in line; but I do not follow him in considering line of bearing a good formation then. Line is hard enough to keep; line of bearing is much worse, and the end of the approach is no time for disorder. I have personally seen in battle exercises one or two illustrations of the lamentable disorder that may result from line of bearing approach, and they have removed any prepossessions I may once have had for it.

On pages 10-13 the essayist draws comparisons between three methods of doing certain evolutions, in which he introduces a consideration of gun fire. The reason for this is somewhat difficult to see, as none of the evolutions, possibly excepting the last, would be excusable if done within gunfire. And I confess to a certain amount of impatience at seeing the "special method" for the first two evolutions brought into the comparison. Such tactical gymnastics are possible on paper, but in my opinion they are impracticable on the sea with real ships, and would be foolhardy if attempted under fire. The "special method" for the third evolution has value, though in reality it is only a modification of the "direct method." It would be valuable in taking up the pursuit under some circumstances, and it is the common-sense method as opposed to the "direct method," which *slows the leader.*

This seems to be an appropriate place to express an opinion of many years' growth about the direct, really oblique, method, which is open to two grave objections; it is generally slower than the rectangular method, which entails being longer in a broken formation; and it requires changes of speed. To these must be added a third objection when evolutions from line to column are considered—their danger—though this does not hold in evolutions from column to line. The first two objections are sufficient in themselves to condemn the method generally. In evolutions from line to column the third objection should clinch the argument. I hope yet to see the method expunged from our fleet drills. If that is expecting too much, I yet venture to hope that the direct method of going from line into column may be discontinued. There is quite enough to do in getting a fleet so that it can follow the leader and perform rectangular movements perfectly without burning coal and using valuable time in doing evolutions of a kind that are obviously inferior.

On page 16 of the essay two laws are formulated that are said to govern the maneuvers of two squadrons within fighting range. The statement of the first is open to objection; it fits perfectly the most disadvantageous position—when one's own fleet is in line and is capped by the enemy in column. I should prefer a statement of the law, if law be the proper word to use, something as follows: The advantageous position is that in which one's own line of bearing produced does not pass through the enemy's formation and his line of bearing produced does pass through one's own formation. The nearer the lines of bearing are at right angles the better, and the nearer to the center of one's formation the place where the enemy's line of bearing pierces the better. This statement is true irrespective of the character of the fire, broadside or end on. It is, of course, only an ideal, for if the enemy knows his business he will never be caught in such a predicament; and in maneuvering to avoid it the second law given by the essayist, which is really only a corollary of the first as here stated, will come into play, and there will be a parallel fight, which will almost certainly be a column fight. There is a rule of conduct resulting from reasoning and reinforced by gameboard practice, that applies to the maneuvers of two squadrons within fighting range, and that may be expressed as follows: Maneuver as little as possible when once within range.

Changes of speed, of heading and of formation, all tend to derange fire control. The gameboard axiom is slangily expressed by saying that the player who "does stunts" under fire gets whipped.

I cannot in the least agree with the following sentence, to be found on page 20: "The foregoing examples have been those that will be *most frequently* met with during the engagement at medium ranges" (italics mine). With skilful adversaries such examples will rarely, if ever, be met within effective range, let alone medium range.

Within a day or so it has come to my knowledge that an officer of excellent judgment, who has had unusual opportunities for observation, has stated in effect that he regards as a very serious handicap a breeze of about 15 knots velocity from the bow opposite to the firing battery. He states that smoke from the guns hangs in front of the target, that hot gases in line cause erratic shooting, and that the smoke from the boilers often almost obscures the target. If this observation is confirmed by general experience it will have a great bearing on the value of the weather vantage, which I have hitherto estimated much as the essayist does, and have regarded as distinctly an advantage. Similarly the use of colored shades may obviate the disadvantage of having to face the sun glare. At the same time, if I were going into action to-day I should prefer a position to windward and to seaward of my enemy, as the essayist does.

On page 33 the essayist considers "the automobile torpedo as having a maximum range of 3000 yards." This is so wide of the range obtained by recent designs that the figures must be a misprint.

The distinguished Vice-Admiral Colomb has given one such excellent reason why there should be a well founded body of opinion upon tactical matters that I will close these remarks by a short quotation from a lecture that he wrote as long ago as 1871 on the subject of The Attack and Defence of Fleets. He says: "I believe that we are not sufficiently alive to the fact that the current view of the attack and defence of fleets is the foundation of all design in naval *matériel*." Again: "He (the naval officer) first forms views of the attack and defence, and these find expression *afterwards* (author's italics) in material products. If his original idea is crude, unthought out, above all, if there are diversities of ideal, the results in a material form will give rise to vague uncertainties, and useless discussions, such as those by which we find ourselves now surrounded."

Captain E. B. BARRY, U. S. Navy.—Academically this essay is excellent, but some things in it do not appeal to me as convincing.

I am glad to notice the introduction of the time element. This does not often appear in print though we made much use of it in the Atlantic fleet at times when our muck rake critics would have the guileless American public believe we were idling away our winters doing nothing.

The writer tells us groups shorten the formation by increasing the depth and he adds that the group ships nearest the enemy are at a shorter mean range than the mean range of any ship in the column formation. This is a strong argument for the column to concentrate on the salient ships of the groups, but no mention seems to be made of it.

I do not like the use of the term "line of bearing" in defining *exact column*. It is evident that the author wishes to separate his formations into two clearly defined and, so to speak, primary formations defining themselves; exact column and line; also a third formation that is to embrace everything else; hence column should be defined without the use of the term "line of bearing." Exact column: two or more ships following one another at a given distance apart on a straight line passing fore and aft through their keels.

The area of full broadside fire is limited practically by the extreme train aft of the forward gun of the head of the column and the extreme train forward of the after gun of the rear ship of the column.

The half angle *LGA* in Plate II should have been drawn from the bow of No. 2 and should be parallel to *BH*.

Line should be defined similarly to exact column. Line: Two or more ships steering the same course at a given distance apart on a line passing athwart their middles at right angles to the course.

In Plate III, the line *BIA* is correctly the practical half angle if measured from the forward gun of the second ship clear of K's bow.

The rectangular method is opposed to the oblique. The definition of special methods should read "The aim is to reach the new formation by some method not laid down in tactics." This is the favorite ground for the academic specialist. Any series of turns and twists dangerous or not, by which some standard change of formation can be done away with is truly and indeed a special method. These methods are perfect when executed with gigantic battleships two or three inches in length on a game board where the mighty ocean is varnish and the speed is regulated by the same agility that governs the king's movement in chess! It is vastly different when these academicians are put to doing the real things in a ten to twenty thousand ton battleship; then special methods are forgotten and we return to our mutton.

In Plate VI I notice the oblique to form column is executed correctly and not as given in a former treatise. The only so-called special method that is safe by which column could be formed more quickly on any designated vessel, would be by increased speed to her left or right as the signal might call for. For example, to form column to the front on No. 6, when the signal of execution is hauled down No. 6 holds course and speed, vessels to the right slow and oblique, but Nos. 7 and 8 take full speed and sheer in ahead of No. 6 in succession. The ships will not be thrown out of formation, there will be no danger and the head of the column will be steadied before the rear ship has entered the formation.

It is difficult to understand what is to be gained by the special method of Plate VII. What is "slightly reduced speed?" It may be half, or slow, or it may be a decrease of one or two revolutions, no such term is possible in fleet tactics. If a special method must be required to form column from the center, let the first division execute ships right (Plate VII) and oblique to the right at reserve speed taking standard in succession at the proper time, while the second division executes column right. The first division will not interfere with gun fire and will be in station before the

eighth ship is steadied on the new course; there is less swinging around, less interference with the steadiness of guns' crews, and the ships remain in natural order.

In the special method of forming a line of bearing from column and also in the direct method, there is no reason for slowing the head of the column; if the rear ships take reserve speed the formation will be attained with much greater facility.

I cannot accept as stated the first law governing maneuvers of two squadrons within fighting range.

The most advantageous position is column, broadside fire bearing, and perpendicular to the enemy's line of bearing. There are other advantageous positions, by which is meant that one squadron is better situated than the other, but there is only one *most* advantageous position.

In Plate IX, if the squadrons are in fighting range "A" does not want to cross ahead of "B." Before the leading ship reaches the prolongation of "B's" line of bearing, "A" should take half speed and destroy the head of "B's" column. It seems well to add that a fleet or squadron getting into "B's" fix deserves to be destroyed.

The rest of these cases are admirably stated.

I do not quite agree with the imaginary battle. I should have stood off to the northward to draw "A" in that direction, and when just out of range form column heading about west. If "A" engaged it must be on equal terms in parallel column, but "A" first would have to come about and "B" might force the passage.

In the engagement as depicted, when "A" swings into line to close the range, if there is any fight or hitting power left in "B" he should be able to defeat "A" during the time "A" is "swinging" and in line, while his volume of fire is reduced about two thirds. This maneuver would correspond exactly with the Chinese tactics at the battle of the Yalu. "A's" proper move is head of column right clear of the shore.

The remarks on the weather and wind are admirable, except that the fourth point, relating to gun fire efficiency, requires but one answer—stop the firing. The advantage of steadying the gun's crews will more than compensate for the loss of fire during a period that must of necessity be very short.

Under concentration of fire I cannot agree exactly with the essayist. In the first place concentration of fire should be defined as fire from ships in fleet or squadron when the fire of more than one ship is directed simultaneously at one or more enemy ships.

Napoleon's victories were gained by concentration of forces and that brought about concentration of fire, and that is all that numbers ever bring about at the point of superiority. Presumably two soldiers each armed with a musket attacking one soldier armed with one musket will defeat him, so also fifty thousand men attacking twenty or thirty thousand men should defeat them. Napoleon's genius usually brought this about.

I think the conclusions follow from the premises in every case cited, but are the premises correct? I doubt if any admiral would concentrate the fire, let us say of eight ships, on one ship of the enemy leaving seven

unattacked to work their will. I think my reply would be to concentrate two and two on his four leaders and knock them out just about the time my one ship got used up. Probably my uninjured seven would defeat his uninjured three.

When we get to the selection of a target we come to an ancient idea, modernized. The only man aboard ship capable of handling her in battle is the ordnance officer. "He must be thoroughly familiar with the tactics of the commander-in-chief and must duly consider the chances of a change of course or formation." What is the captain doing all this time? Poor useless animal, responsible for the failure and praised for success, this pale ghost of command will be better employed tending the wounded.

When we compare the essayist's ideas of concentration with his account of the battle of Tsushima I fail to see one idea of concentration as given by him as applying to the battle. In fact, I draw the inference that the Japanese won because they made use of concentration. Napoleon once more.

The torpedo part of the essay is most interesting and Plates XIII and XIV are diagrams well worth study. I cannot reconcile myself to any such situation arising as is depicted in Plate XV except for purposes of illustration.

Eight ships on a 45° line of bearing to eight ships in a column could not blame the column if it changed course. There is no use in going to a lot of trouble to get into a nasty fix and then taking more trouble to stay in it. The same remarks apply to Plate XVI, Fig. 2.

In the fleet evolutions the importance of the time element is well shown. Sufficient weight has not been given this in most discussions, but its importance was recognized years ago by the practical workers under Admiral Evans and to some extent even before his time.

The general scope of the essay and the topic chosen are admirable, and had the application of geometry been limited to the torpedo work, I think the essay would have been vastly improved.

The author, Lieutenant W. S. Pye, U. S. N., is to be congratulated on his essay.

Commander W. R. RUSH, U. S. Navy.—Once again, in this article, are we confronted with a clear and able presentation of the virgin truths of the Fleet Drill Book and the Game Board; nailed to the mast tight enough this time by appeal to Commander Niblack and Lieutenant Dewar, as authorities regarding these truths; and, in the humble opinion of the writer, there are no greater authorities living.

Referring to page 34 of the essay, it is submitted that: the course of firing ships needs not to be considered, owing to ability to train torpedo in azimuth, and to ability to swing ships to the course necessary for firing torpedoes. The curved fire torpedo has not yet been developed to that degree which will result in its adoption by any navy, although it is in course of rapid development.

And again, page 37, Plate XV: The ships in column are more exposed to torpedo fire than those of the line of bearing in the lead.

By drawing to scale, and allowing a speed of 15 knots for both fleets, and with torpedo ranges given, no ship of the line of bearing in the lead is in torpedo range of the fleet in column; whereas all of the ships in column are in torpedo range of the left two of the line of bearing in the lead, and three of the ships in column are within torpedo range of five of the ships in line of bearing in the lead.

Yet we may ask, what matters it to the busy student, to be told that on the game board, you can actually get two divisions, in column at distance, into a two point echelon in so many minutes and so many seconds?

You couldn't do it at all in battle, and you wouldn't want it then, according to the writer's lights, especially if you were confronted by a live enemy in column. It is admitted without question that the whirls and twirls of the fleets on paper, or on the game board, are most interesting to watch, and this elementary study is most absorbing; but, as in the case with other like indoor games and puzzles, while they interest us and fascinate our attention for a season, we tire of them; of their limitations, their unproductiveness.

How much, I pray you, of equestrianism for example, or rowing can you learn from pictures in a book written on these subjects; and moreover, suppose if you please, you do learn the book, do you find that it has taught you that which pleases you most, or that which you find you want when once astride your mount, or finally settled in your boat?

I submit that all is different then; your eye and hand have different guidance; all the externals of reality exert an influence upon you and upon your every action, and, thus, unconsciously perhaps, is skill implanted in you and your mature judgment formed aright.

And so it is in the study of squadron battle tactics, the surroundings of reality, as in war, or the simulation of this reality, in peace preparation for war must ever be sought, and found too, if it is possible so to do; and therein, it is submitted, lies the true means of education in tactics.

Let us struggle no more with the fluttering candle of theory, to light the subject of naval battle tactics; switch on the search-lights—the big fellows—all of them. The fleet, squadron and division commanders are those to whom we rightly look for light on battle tactics; with their experience, skill, and the material at hand, what satisfying results can be obtained, what splendid battle tactics made possible.

No, you say, we must creep before we can walk! Eh bien! if so be, that we are really not yet "walking" in tactics, then hurrah! for a good creep, but first of all let us creep off the game board and—overboard.

We must *not* stay on the game board unless we are going to fight our enemies there; we must do our creeping on the water now, in order that, later we may walk upon it with faith and confidence. Aye! with more faith than the apostle of old ever had in his Lord and Master; for we are destined to, and must, finally walk and run, and even fight on the water.

To creep with success we must have some small squadrons of some small ships to devote to, and to expend, if necessary, in the practice of fleet battle tactics. They must be small—but not too small—in order that

our falls and tumbles may not be too hazardous of life, or too expensive to afford.

Can this be done?

It can, and in this way; in Manila Bay we have the finest body of water in the whole world, in which to exercise our squadrons, with the accompaniment of an equable and healthful climate, and perfect weather conditions for by far the greater part of the year.

At Manila and Cavite we have divisions and squadrons of vessels, more or less in and out of commission, with some of their kind, at more or less peaceful rest on the bosom of Chinese waters. By name, a few of these are *Elcano, Quiros, Mindoro, Pampanga, Panay, Mariveles, Samar,* and *Villalobos;* and there are others of the coast guard service, swelling the total into two homogeneous squadrons. Here at last is homogeneity!

Homogeneous in point of small size, great age and general worthlessness in war, but, indeed, very worthy and of great use in the golden hours of preparation for war.

How?

In this way; organize all these boats into two squadrons composing a battle tactics fleet of evolution, attached to, and under the command of the senior naval officer in command on the station. The personnel of this fleet to consist of a commander, an officer or petty officer in command of each boat, and a small Filipino crew; lay down moorings for every one of them, and establish a system of coal and repair supply, to have the right-of-way, and woe to him who should, innocently or guiltily tie up the fleet of evolution with red tape! It should be always ready for use; ready to slip and do a day's steaming at its own standard speed; and, if not ready, the commander of the laggard must tell why in open court.

This evolutionary fleet would then be the *Tactical School of the Fleet!*

The detail for any day should consist of squadron, division and ship commanders, their staffs and assistants; they should board their commands in the morning, and moor them at night before returning to their ships.

Tactical exercises, *battle* tactical exercises—not "Cipher A" drill, should be set by the senior naval officer in command on the station to be worked over, and a succinct report of the day's work, after the manner of reporting an engagement, should be submitted to him by the squadron commanders at close of day.

Here are the boats and the bay; the officers and the men and the pressing need; we lack the spirit, the organizers and the money.

Can we have these?

Courage and Prudence.

(SEE No. 125.)

Rear-Admiral C. M. CHESTER, U. S. Navy.—I have read with much interest, the article in the March number of the PROCEEDINGS, entitled, "Courage and Prudence," and am glad that an officer of Captain Fiske's ability, has had the moral courage to set forth the war side of the gun-fire practice of our fleet with so much force. I have often heard it said, that in the next

great naval battle a few strenuous moments may make or ruin a nation, that the commander-in-chief of the fleet, will have more need for moral than for physical courage, which latter quality most men possess naturally. He must battle against an ever present fear of being seen inside a conning-tower, where should be the paraphernalia for handling the force, much more than that of being struck down by an enemy's shell, particularly as under the present arrangements of our ships, he is not expected to be located therein.

On the other hand, the man in the fire-control party stationed in the fighting top of a ship in battle, with duties that preclude his taking advantage of that best antidote for cowardice—work for mind and body—need have no fear of his courage being questioned if he so controls his nerves as to be able to carry on uninterruptedly, the important duties of observing the fall of shots. To show that this may be no easy matter, I will relate a story of the Civil War, that seems to cover the case. A prominent officer of our navy, whose courage has been tested in more battles than are likely to fall to the share of any officer of the present generation, was at the time the young executive officer of a ship, engaged, in the Mississippi river, in that strategic game that Farragut originated of running by batteries on the land. He and his captain, also a man of much experience, were on the bridge of the ship while the enemy's shot and shell went screeching over them. The captain, entirely unconscious of his own movements when the shot came near, noticing a slight tendency to stoop before the oncoming missiles, on the part of his executive officer, jokingly said to him "What are you stooping for?" The junior's reply was made with some feeling to the effect that his statue had not altered so much as a hair's breadth; and after the next shot which passed but a short distance above their heads, he recovered somewhat quicker than did his captain, who was found still in a yielding position, and immediately retaliated by saying "Captain, have you lost anything?" The ludicrousness of the situation then struck them both simultaneously, and they broke out into a hearty laugh. It is said that Admiral Farragut himself, once hearing a young officer chide a subordinate for dodging, said to him, "Do not rebuke a man for that as long as he comes into action in plenty of time. I dodge myself." He could, soon after, however, upon receiving a report that a shell had become jammed in the muzzle of one of the guns, go to the division of this same officer, and after directing him to send all his men to a safe distance, pull the lock string himself which fired the gun in this precarious condition.

I am inclined, therefore, to agree with Captain Fiske that we may expect the fire-control party, in battle, if stationed as at present, to show a disposition to make themselves small when shell are bursting around them, even if they escape being burned to a crisp by the flame from the shells, and so unconsciously, perhaps, the reliability of their work may be affected.

I have watched with great interest and admiration, the wonderful improvement of our men in shooting at a target, but nevertheless have been somewhat concerned regarding the record they will make in actual conflict with an enemy, and am quite in accord with practically all that Captain

Fiske has said on the subject. I maintain, as I did when this work was first begun, that the system now in vogue, does not fully meet the conditions of war service, and that some additional practice should be introduced to prepare for this eventuality. A number of officers, to whom I have expressed my fears, have invariably said, that the present drills were only preliminary, and that when the men were well founded in the details, battle practice would be taken up. As, however, the crews of our ships are constantly shifting, and new material is brought behind the gun, it is doubtful if they will ever reach the graduating class, under our present system of drills.

It seems to me, therefore, an absolute necessity that drills should be carried on at sea as well as in port, and as far as gun practice is concerned the latter should predominate, if we are to thoroughly prepare for fleet actions of the future. It may be admitted, as stated by Captain Fiske, that our gun pointers will shoot better in rough water, by practicing in smooth water, than if they do not practice at all; but it must also be admitted that, as a rule, they cannot reach a high degree of perfection in war service, unless some supplemental practice to that now in vogue is undertaken, that shall be in line with the probable conditions of battle.

Harbor practice educates the eye only, while sea practice calls into operation the good qualities of the eye, as well as quick and efficient judgment, for which our men have been noted from time immemorial, and which is more essential to-day than ever before. The one service calls for firing, practically from a steady platform at a stationary object as does the rifleman at the butts, and marksmen of this character may be formed in an incredibly short space of time, as experience will show; but men who are limited to the latter practice cannot become good wing shots, and no more can our smooth-water marksmen become qualified to fight battles at sea without other practice than that afforded by our present system. This difference in marksmanship is well understood by sportsmen, many of whom, though expert in rifle shooting, to which our smooth-water practice assimilates, regard it as a waste of time to try to shoot birds on the wing. They have no aptitude for it whatever.

It is always an easy matter, however, to criticise, and quite difficult to suggest a remedy, but while subject to the call of "chestnut," I venture to again bring up the subject of sub-caliber practice at sea, as a good supplemental drill for those now in use.

It has the merit of cheapness at all events, and will add one more lesson to the school of the gun, that will in no wise detract from present methods. Of course it is understood that this drill has not been entirely cancelled from the service, but it seems to be so little used to-day as to gain nothing from it.

From the time Admiral Luce, with his able assistant, Lieutenant Meigs, first introduced systematic target practice into the North Atlantic squadron and into the navy, I have seen so much benefit derived from the use of sub-caliber practice that I feel warranted in urging that more of it should take place from our ships. Whenever I have had the power I have required that a portion of each day, when ships were at sea, should be given

up to target practice, leaving for the much longer time when at anchor, the drills that could be carried on better there.

Under this rule, the U. S. S. *Kentucky*, on a voyage from New York to Manila, missed only two days from the routine of sub-caliber target practice while at sea, and this was during a gale of wind of such force that a trans-Atlantic liner, near us, raced out one of her propellers. A number of targets were put overboard at such times and for about one hour the ship steamed around them firing all the guns fitted with sub-calibers. The exercise was frequently closed by a round of full service charges, to give the full effect of firing in battle, and there was expended during the trip something like 100,000 charges of 45-caliber and one-pounder ammunition besides all the quarterly allowance of full service ammunition. The crew thus had the benefit of continuous drills under all conditions of wind and sea, which, besides accustoming the men to the sea habit, trained their eyes, judgment, and nerve as well.

While upon this subject I will add that, as it was necessary for all gun ports to be kept open during the drills, not only the men, but the ship as well, were tried under sea conditions. The result was to settle to my satisfaction at least, and I think also to the others on board, the question of the adaptibility of our low free-board class of ships for war purposes, a question that while it was in its infancy at the time (1900) was more discussed than at present. To be sure, in extreme cases water might enter the ship through exposed ports, but it was found that under average conditions, in which battles are likely to take place, the *Kentucky*, a vessel that represents a type of vessel of minimum free-board, was fully prepared for a contest with an enemy at sea, even though there might be a slight risk of some of the men getting wet at such times.

As experience is the best teacher I will mention one other event relating to sub-caliber work, which I found to be beneficial to the ships concerned and perhaps it may be interesting to the readers of the Proceedings of the society. This related to preparations for the Spanish War by the South Atlantic squadron then under my command. While the three vessels composing the squadron had been extensively engaged in target practice during their stay in port, they also kept the drills when proceeding at full speed across the Caribbean sea to join the force of the North Atlantic squadron. During the run each vessel towed a small target astern at which the sub-calibers of the consorts kept up a continuous fire from early morning till late at night, the ships being formed in double column for the purpose. So much for sea practice.

Confirming the conclusions of Captain Fiske (from some experience with the stadimeter, that perhaps would antedate his) that "any plan whatever by which fire control in battle is attempted from exposed positions, must lead us to hopeless and complete disaster," I might refer to a plan for fire control which I know to be in existence that would perhaps meet the conditions of war better than the one he proposes. It has not been submitted to the service as a whole, through fear, I imagine, of a similar experience to that related by the captain, when an excellent suggestion relating to a conning-tower supporting a roof through which a periscope

projected, was dismissed with the extraordinary statement that "the mirrors would distort the image." When it is remembered that experiences of this kind have been so common that a prominent cabinet officer, in a speech delivered to the graduating class of the Revenue Marine Service, in 1900, could say "In one of these departments, I will not say which (the which, however, was published), we court-martial subordinates for having ideas," may we not hope that Captain Fiske's efforts for the good of the service may result in a change in this system of condemning suggestions without investigation as well as in the target practice and fire-control system.

Lieut.-Comdr. YATES STIRLING, JR., U. S. Navy.—Captain Fiske's article in the March issue of the INSTITUTE should furnish much food for thought to not only officers of the service, but to those in the national congress of our country. In a republic such as ours it seems unlikely that we shall ever be in the strictest sense of the word "prepared" for war.

Protection of the Compass.—The plan proposed is good, the service must by this time appreciate how handicapped it will be in battle without a compass to steer by, for those unprotected will not be of service.

Fire Control.—The author clearly shows the faults in the present system, and claims his plan will eliminate them, yet to correct his range finder he resorts to spotting, the very thing he so forcibly condemns.

Range Finders.—The short base range finders installed on our ships have been almost universally condemned by officers of the fleet. The principal objections seem to be:

(1) Short base compared to the great range of battle.

(2) Unreliability due to changes caused by temperature.

(3) Jarring out of adjustment by discharge of firing.

(4) Vibration caused by machinery at high speeds.

(5) The necessity of cool, calm observation for accuracy, a condition of observer rarely found in action.

Probably the first three objections can be overcome by careful workmanship and by making the range finder solid enough, but the fourth and fifth cannot be eradicated so easily.

Captain Fiske says his range finder has but an error of 1 per cent, this is from observations on shore or on board ship at anchor in smooth water. However, that it can be made so accurate rules out Objection 1. Objection 2, I believe, can be corrected by the use of metals with different expansions. Objection 3 can be cast away by making the instrument as strong and solid as we have the telescope sight. Objection 4 may be lessened by mounting the range finder on a heavy mass of metal like a turret, as the inventor suggests: Objection 5 can be controlled by laboriously training certain men to use the instrument. In time their acquired expertness may overrule the objection.

The plea of an inventor who has produced so many valuable implements for the navy should not be cast thoughtlessly aside. Remember the resistance against his telescope sight at its inception! If we regard critically Captain Fiske's inventions, where has he failed to succeed eventually?

Some are now so much improved upon that we have lost sight of the fact he was the originator of the idea, and in every case the active support of the officers of the service was withheld. When the invention was crowned with success, our *forgetful* navy forgot even to give him his share of the praise.

Now with these lessons before us, would it not be wise to give his range finder a hearing? Not by a ***star chamber board of so-called experts*** but by building such a range finder on the turret of a modern battleship and allowing her to compete in moderately rough water with a similar battleship provided with but the instruments which we have already.

Before the test can be made the observers must be given at least a month's training. Use a moving target at 7000 yards, have all the officers of the fleet observe the test and make reports. *Allow the navy to select the instrument which it believes is better.*

Even if the *plan* of Captain Fiske's is condemned by the officers of the fleet, if the range finder is found even half as accurate as he claims, it will be a valuable adjunct to the projector, for by tracking the enemy the two unknown quantities needed by the projector (course and speed of the enemy) will be known with greater accuracy than by means of the "vernier eye."

Conning-towers.—The perescope idea for use with a conning-tower, even if it may have many disadvantages such as becoming befogged by spray from short shots of the enemy, is well worth a trial. At present in every ship we have the conning-tower is no more than so much extra metal. With a perescope it would immediately become serviceable, and at an expense ridiculously small.

Professor PHILIP R. ALGER, U. S. Navy.—Captain Fiske has set forth very clearly the difficulties and disadvantages of the system of fire control at present used in our own and the British Navy. It can hardly be gainsaid that the results obtained with this system under target practice conditions are no criterion of what can be accomplished with the same system in action and with the ordinary weather conditions of the high seas.

Would it not be well, without further delay, to determine by actual trial to what extent gun-fire can be accurately regulated at 5000 to 7000 yards range in a moderate sea? There need not be competition between ships, but a selected ship could compete against her own previous record in smooth water. A single test *might* demonstrate the impracticability of the method of vertical spotting; without such a test we may continue indefinitely possessed of a false belief in our gunnery efficiency.

A Japanese naval officer who went through both the battle of August 10 and that of the Sea of Japan said to me, in a discussion of this subject, "the best system of fire control is a good range finder," and I must confess that that has always been, and is now, my own opinion. The principal objection to dependence upon a range finder is the alleged inaccuracy and want of reliability of such instruments. But has a really serious attempt been made to construct an accurate and reliable range finder? The problem of range finding is merely the problem of measuring a small angle;

there is no mystery about it; it is a question of good mechanical design and of extremely careful workmanship. If the government will pay the money it can get range finders which are many times more accurate and many times more reliable than the human eye. No amount of training will get around the inherent deficiency of the eye as a distance-measuring instrument, and the various methods which *apparently* increase its accuracy are but tricks that fool the unreflecting.

I am aware that at present it is thought necessary to calibrate guns before target practice in order to determine the difference between the true range and the sight-bar range, and that the existence of this difference is thought to be a bar to the sole use of a range-finder, however accurate, in regulating gun-fire. But let me point out that the variation in range at the same elevation on different occasions is due to removable causes, while the errors of the eye in spotting are unavoidable.

Variations in weight of shell, and in weight of charge, and above all insufficient rotating bands, have caused excessive variations in the range from round to round, but these defects have been largely eliminated, with the result that the hits of an accurately pointed gun can now be counted upon to bunch close together. Similarly, increased uniformity in manufacture, increased care to secure uniform conditions of moisture and temperature in storage, and more accurate sight graduations will result in greater uniformity of range for the same sight-bar setting on different occasions and with different guns. If as great pains are taken to eliminate these differences as have been taken to correct for them, I predict that the time will very soon come when an accurate range finder and means of transmitting its results to the guns will constitute not only the best but a truly efficient fire-control system.

Aids to Contentment in the Navy.

(SEE No. 123.)

Ensign R. R. RIGGS, U. S. Navy.—The last line of the following paragraph, quoted from "Aids to Contentment in the Navy" in No. 123 of the PROCEEDINGS, is my excuse for relating a personal experience.

"It has been suggested, as an expedient that has worked well in practice on board a certain torpedo destroyer, that an excellent form of punishment is in withholding some of a man's pay by 'classing him.' This is of the nature of a fine, while not taking actually from him that which is his. The gangway, in this case, is still free. I would like to hear from my brother officers on this point."

During the greater part of the year 1906 and part of 1907 I had command of the gunboat *Arayat*, cruising in Philippine waters. I had no master-at-arms, (and of course no marines), no brig, and I was very seldom where there were enough commissioned officers to hold a summary court-martial. I had a small compartment opening off the engine-room that could be used for a brig in case of necessity, but I did not like to do so as the absence of electric fans made the ventilation very bad at the best, and when under way the heat was intolerable. On some of the gun-

boats of the same type, the captains used the lazaret under the quarter-deck as a brig, but I never did so as the place was so small that a man could not stand upright. Our sources of amusement in the southern islands were very limited and the duty often got very monotonous, so I felt that deprivation of liberty was a real hardship, and I also felt that with so small a ship and crew, restriction would cause undue discontent, which would be easily caught by the men not being punished. Therefore I made it a rule that men would be deprived of liberty only for two offences—overstaying leave and drinking on board ship. In this way I found myself, with very little experience to guide me, confronted with the problem of keeping up discipline and of finding some legal and practicable means of punishing offenders.

In the first place, I went on the assumption that liberty was a right and not a privilege, and that if there were no reason for a man to be on board ship, there was every reason for his being ashore. The petty officers were given a free gangway, and those who were required aboard for duty knew it as well as an officer would, and stayed. The crew were divided into two liberty sections and all of one of these sections were put on the liberty list every day, one taking the odd and the other the even days. If any man desired to go ashore on any day but his own, he had simply to give in his name before one o'clock each day. The only reason that they were not all put down each day, or given a free gangway, was that in case there was any work to be done requiring a certain number of men to be on board, there could be no question as to who they should be. Every pay day, the men were given 48 hours' liberty without asking for it, so that in case they decided not to come back in the morning, they did not have to do so. In this way they spent their money in a day or two, and I could hardly drive them off the ship for the rest of the month. Sometimes I had almost to order them on hunting or swimming parties, to get them off the ship, to keep them from hating themselves, and me, and the ship, and all concerned. This worked so well that, with one exception that I will speak of later, I never had a man as much as 20 minutes over time. The one exception was a man that came to me from the *Ohio* when she went home. His record was one list of "over leave," "absent without leave," "drunk on board ship," "Striking master-at-arms," etc. ad infinitum. Why he was ever sent to such a ship I cannot imagine. I had a rule which I explained to all newcomers, that if a man came to the ship classed, he would be advanced one class each month, but so long as he behaved he would receive first class privileges in the meantime. This man came to the ship third class, and the first thing he did was to overstay his liberty four and one-half hours. I gave him the regular punishment, reduction of one class, which made him fourth class, and he, thinking that he had been much abused, by not being second class, proceeded to get full on board. I telegraphed for his detachment, and received an affirmative answer the next day. As he was the only one who ever broke his liberty, and as he was the only one of the crew I ever saw drunk either ashore or on board, I never had to restrict a single man. I hit upon the expedient of the torpedo-boat officer that you quoted—that of simply holding up the pay of

classed men, and nothing more. In all the time that I was in command, I assigned but 18 punishments, and practically all of these were little errors of omission, not commission, which could not be overlooked and had to go on the man's record, but did not require much punishment. And this was with a crew that had a very bad name when I joined the ship.

Much of this success, however, was due to the petty officers. I gave them officers' privileges and expected an officer's sense of duty from them. I said that if anything went wrong on board ship I would hold them absolutely responsible. The mere fact of their knowing nothing about it would not be accepted as an excuse; the ship was so small that if they did their duty they would be sure to know about it. I told them that I had made them, and I could and would break them, and get men that I could trust. I never found a case where they failed me.

Ordinarily I do not like the idea of holding back a man's pay and even doubt the legality of it, but in the position in which I found myself, it was the lesser of the evils provided for in the regulations. It worked to perfection on this small ship, where we had paternal government, but for *all* ships, fines would be infinitely preferable to confinement. To put a man in irons in a cell for something that is not a crime is enough to make a criminal of many men, and petty officers in particular lose prestige by it. Fines would not only not injure a man's self-respect, but in most cases they would remove the source of the evil.

The Money for the Navy.

(SEE NO. 125.)

Naval Constructor THOMAS F. RUHM, U. S. Navy.—The various papers by Mr. Mudd, on this and kindred subjects, have been read by me with the greatest interest and appreciation of the masterly manner in which Mr. Mudd handles his subject; but there are certain features which viewed from a purely professional standpoint, I think are open to some criticism; and others which, to be accurately understood, require some additional information.

(1) The criticisms of the cumbersome wording of appropriation bills is well founded; a simplification thereof could be possibly brought about by legislation definitely and in detail fixing the division of the various features of ship work among the several technical bureaus. Such division is now dependent on more or less vague articles of the navy regulations which are subject to indefinite changes from time to time by the powers that be. It is natural that each bureau should be desirous of having its part of the appropriation bill worded so as to avoid, as far as possible, later discussion as to which bureau has cognizance over any particular article or auxiliary.

(2) The criticisms of the Bureau C. & R. control of the "kinds, quantities and style of so many articles of ships' equipage, and supplies" are misleading. The complement of the ship is fixed by the proper authority, and the outfit is based thereon—the basis being so many of each article to so many men—this basis being the result of information gathered from

those using the articles. The type is also based on experience, but there are more differences of opinion regarding type than quantity. In any group of officers will be found differences of opinion on most simple articles: the chair that suits the doctor might not suit the paymaster—the selection of either might not suit the admiral.

The statement "'Ship Construction' has no more right from the viewpoint of economical efficiency, to have complete control of an important portion of the sea allowance than it has to determine the size of the paymaster's safe, or the quantity of paregoric to be carried in the sick bay chest" is true, but its use is misleading. There are, first, certain articles of ship equipage which depend on the design of the parts with which such equipage is used; second, articles of equipage for use of the personnel; third, spares; and fourth, supplies for use in connection with various sorts of ship's work or repairs performed on board. The articles of the first sort are fixed by the nature of the part with which used, for instance, chainchocks, anchor bars, wrenches, etc.; those of the second sort are based on the number of the personnel; those of the third and fourth sorts on the quantities shown by experience to have been necessary. Granting to the "trade" ordinary common sense, who better than that "trade" could, from experience with ships coming to the yards for repairs and with requisitions submitted from time to time by ships in commission, and from criticisms of those using the appliances on ships, prepare an allowance for a ship. It is easy to criticise, and well-based criticism should always be heeded, but it is more difficult to originate. Should the ordnance officer draw up the construction allowance? the equipment officer the ordnance? or should each draw up that which his "trade" brings him in touch with? or should the pay officer draw up all? Each allowance is just as much an expression of service experience and necessity as is the quantity of clothing and small stores, and the nature of the provisions carried by the pay department.

(3) Was not the Bureau of Yards and Docks right in objecting to the purchase of the motor truck for the general store-keeper? If each department of the yard had its own motor trucks, its own cranes, its own railroads, and kindred appliances, what would become of the economy which Mr. Mudd so appropriately and ably advocates? Why should the G. S. K. require a locomotive and flat car to carry a "hatful of supplies to a ship?" Does the G. S. K. actually haul a monkey wrench or anything else for any other department? Is it not rather the case that a large part of the G. S. K. work is done by other yard departments?

(4) The suggestions as to inspection of navy yard accounts in the manufacturing and constructing departments, and as to enforced competition between the yards doing similar work, are worthy of considerable consideration.

There is, however, considerable room for argument as to the best way in which this inspection could be accomplished. Each bureau is responsible for the expenditures under its cognizance—why would not the creation of the office of a navy yard inspector for each bureau, as suggested by Mr. Hoff be a better beginning than the inauguration of the system by first

utilizing the "night watchman?" That such inspection could be handled by a pay officer with no technical experience, in such manner as to produce any satisfactory results whatever, is in my opinion questionable. The proposed inspection would be along very different lines from the present money and property inspection of pay officers' accounts. There might also be included in the new inspection, an inspection of the general storekeeper's stock and accounts.

The comments of Admiral Goodrich relative to navy yard competition, and relative to reducing the number of navy yards, I consider most appropriate. Why not have a fixed number of navy yards on each coast, properly located, completely equipped, an ample number of dry docks in each yard; and have no other yards for repair or building purposes, except of course such yards as may be necessary in our outlying possessions. We are practically dependent now on comparatively few of our navy yards—why not devote to their extension and to additional dry docks the amount we are expending on smaller and less fortunately located yards? Why not form some idea of the ultimate size of our fleet, and add to the best located yards accordingly? In case of war on the Pacific where would our fleet be docked and repaired? We have now at this late day one government dock on the Pacific coast that can take a modern battleship. I believe that the tendency should be towards obtaining more properly located dry docks at once, even if we have to forego for a time one or more battleships to obtain the necessary appropriations.

(5) Any comparison of costs at various navy yards as now existing, to be convincing, must be accompanied by details as to locality, other work going on, whether or not the articles are actually of the same type, etc. The yard on Puget Sound, for instance, pays for labor and material much more than does the Norfolk yard. A certain portion of an establishment must be permanent such as the clerical and drafting force; if during a particular period the work on hand is small that work must carry a large charge for fixed expense. One boat built alone will cost much more than one boat of five. A rudder for one type of boat will cost more than a rudder for another type. Even in the same ship there may be two different styles of mahogany bureaus in the cabins.

All articles of outfit should be, and I believe are being, standardized. If one yard can make the identical article considerably and comparatively cheaper than another yard, something must be wrong; and outside inspection and enforced competition will tend to locate the trouble, provided practical methods of outside inspection and competition are developed.

A great step towards economy in navy yard work would be made if there were discovered some means of more widely separating the military and technical functions of the navy yards. In what private establishment exists the red tape of navy yards due to the combination of the military and the technical, and the additional clerical and office force necessitated thereby?

(6) It is stated by Mr. Mudd "The writer at times has been amused at the way the cost of building ships at our yards and that at private ship yards have been compared. The selling price of the commercially built

ship is coolly put alongside the cost price of the navy yard ship without the flutter of an eyelid."

A navy yard has three distinct functions, it is a military station, it is a constructing or repairing station, and it is a supply station for the fleet. In each function the purely technical is subordinated to the military. To compare the cost of administration of such a yard with a private establishment, and to include it in the cost of turning out manufactured or repair work, would be most unreasonable.

There are certain military officers, marines, watchmen, etc., and there are large numbers of officers, clerks, etc., for handling supplies, a large proportion of which should in no way be considered in figuring costs of navy yard repair or manufacturing work. Supposed the *Connecticut* had not been built at the New York yard, what officers, clerks, watchmen, etc., would have been available for duty elsewhere? What actual increase in cost of administration was involved by building this ship at the navy yard? The facts to be gotten at are the *extra* expenses to the government if any, compared with building by contract: to get at such facts, what portion of the cost of administration should really be included? The yard and its administrative force are there whether the ship is built by private contract or by the government.

Moreover, what private yard pays nine and ten hours' wages for eight hours' work? pays all employees for seven holidays each year? gives all employees, in addition, fifteen days' leave with pay each year? and also closes every Saturday afternoon for three months of each year, but with full day's pay for such Saturdays? All this amounts to the fact the navy yard pays a certain amount for labor, of which about 20 per cent is absolutely without return; all in accordance with existing law.

What private yard is hampered in the employment of labor as are the navy yards?

(8) The foregoing questions, I think, should be considered in a discussion of navy expenditures ashore.

The article of Pay Inspector Mudd is a most valuable contribution, and as he aptly says: "This is the time to do great things in the way of bettering government methods of doing business." A most important step in the right direction would be to adopt a system ashore not based on the aggrandizement of any particular part or corps of the service, but on business lines and for the good of the country.

War on the Sea.

(SEE NO. 125.)

Rear-Admiral F. J. HIGGINSON, U. S. Navy.—I want to congratulate the Institute on the translation of Captain Darrieus' book on "War on the Sea." He is a most interesting and charming writer, and the Institute deserves great credit for introducing him to the service. His style is clear and distinct, and he has, evidently, a thorough knowledge of his subject. He uses such happy and concise expressions to convey great truths. They ought to be painted on the walls of class rooms and halls in large

letters all through the Academy buildings, as religious sayings are displayed in churches, so that maxims of basic importance to the naval profession will sink unconsciously into the minds of our cadets during their four years. These subconscious ideas will float to the surface some day when badly needed. I shall look forward eagerly for the coming numbers of the translation. The book when published will be highly educational and a valuable contribution to the study of naval strategy.

I am sorry that Farragut does not show up more brilliantly among the naval leaders of history, for I am sure that his principles of action were as great as those of any of the leaders mentioned. His sphere of action was, of course, comparatively limited, but within it he showed all the qualities of a great commander. Nelson never took a more desperate chance than did Farragut at Mobile Bay when he dashed at the enemy's torpedo line. I have been alongside of Farragut under fire and he had the boyish elation of spirits and total absence of fear which characterized Nelson in action.

But, of course, fighting forts in a civil war does not measure up to the standard of great strategical and tactical operations with large fleets upon the ocean. Our man for that work may be, as yet, a "mute inglorious" midshipman.

I hope the Institute will continue its encouragement of the discussion of battle tactics and formations. We cannot have too much of it. The maxim that the "cruising formation should be the battle formation"—Is it possible? Perhaps it may be with wireless communication, but that is uncertain and liable to derangement. According to the correspondents our Atlantic fleet cruised either in divisions in column abreast, or line of divisions in column, neither of which are battle formations, and from which rapid deployments are not easy.

Two Pictures of Nelson's Time.

(SEE No. 119.)

GILBERT TOTTEN MCMASTER, M. D.—The picture of Nelson published in the PROCEEDINGS some time since, from Southey's life, wherein the artist's name is obscured, I find is from the pencil of one De Kestre and was drawn from life in 1801, and the favorite of the admiral.

De Kestre was famous, in his time, for the "nicety of his work" in this line. Every line was as it should be, and exactness as to his model his aim. Fortunately for us, impressionism, that fad of art to obliterate faulty drawing, had not dawned, and we have the face as it looked to him one day in the year 1801.

The present Lord Nelson honored me with the following note conveying this information:

TRAFALGAR, SALISBURY, November 2, 1906.

Dear Sir.—I thank you much for the two pictures of Nelson's time. The first was originally drawn by *De Kestre*. He made two pencil drawings and submitted them to the admiral in 1801. One was taken by him at the time, the other one I bought of *De Kestre's* niece. I think it is a powerful and agreeable picture of the great admiral.

I have two pictures of the funeral car, one worked in needle work and the other an old print, but not so good or clearly printed a one as that which you have kindly sent me.

I am yours faithfully,

NELSON.

From the above it will be observed that the Institute has the best reproduction so far of the funeral car that conveyed the great admiral to his last anchorage.

Admiral Lord Charles Beresford, who cannot say too many nice things of our navy and nation, and who has done much to cement bonds of good feeling and friendship between the two great English-speaking peoples, writes me that he has placed the two little prints referred to above in the cabin of his flagship.

PROFESSIONAL NOTES.

Prepared by Professor PHILIP R. ALGER, U. S. Navy.

SHIPS OF WAR, BUDGETS, AND PERSONNEL.

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Ersatz Tegethoff	14,500	Trieste.	Building.
Ersatz Kr.-Rudolf	14,500	"	"
Ersatz Kr.-Stephanie.....	14,500	"	"
Scout.			
Admiral Spaun	3,500	"	"

The *Yacht* states that the *Ersatz Zara* (Admiral Spaun) is to be provided with Parsons turbines of 20,000 horsepower to give a speed of 26.5 knots. Her battery consists of seven 10-centimeter guns.

The three new battleships building for Austria-Hungary have the following details: Displacement, 14,500 tons; length between perpendiculars, 131 meters; beam, 25 meters; draft, 8.1 meters; I. H. P., 20,000, and speed, 20 knots; armament, four 12-inch B. L., paired fore and aft; eight 9.4-inch B. L., paired in turrets at the four corners of the battery, as in the *King Edward VII* class; twenty 4-inch quick-firing in an armored battery; and four * submerged torpedo tubes. The armor is 9 inches thick, thinning to 4 inches at the ends.— *Nautical Gazette.*

BRAZIL.

The two Brazilian battleships being built by Armstrongs have been named *San Paolo* and *Minas-Geraes*, while the one being built by Vickers is called the *Rio-de-Janeiro*. The *Yacht* gives the following as the dimensions of these ships, which are to be completed in 1909: Displacement, 19,250 tons; length, 155.5 meters; beam, 26.6 meters; speed, 20 knots; coal, 2000 tons. It has been stated that their main batteries consist of four 13.5-inch and ten 10-inch guns, but it is quite certain that their largest guns are 12-inch. The Armstrong Works are also building for Brazil two 3500-ton scout cruisers of 26 knots speed, named the *Bahia* and *Rio Grande*.

The Brazilian battleships building at Elswick and Barrow will carry six barbettes, with two 12-inch guns in each, mounted the same as in the American and German vessels of the *Dreadnought* type—that is to say, two forward and two aft on the center line, one higher than the other in each case, and one on each side.—*Army and Navy Gazette.*

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*The *Yacht* states that these ships have but three torpedo tubes, one stern and two broadside. Also that one of the three ships will not be begun until the autumn of 1908. According to the *Moniteur de la Flotte* they are to be named *Franz-Ferdinand, Radetzki,* and *Zrinyi.*

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Vérité	14,865	Bordeaux.	Under trial.
Danton	18,350	Brest.	Building.
Mirabeau	18,350	Lorient.	"
Voltaire	18,350	Bordeaux.	"
Diderot	18,350	St. Nazaire.	"
Condorcet	18,350	"	"
Vergniaud	18,350	La Seyne.	"
Armored Cruisers.			
Ernest Rénan	13,644	St. Nazaire.	Under trial.
Jules Michelet	12,550	Lorient.	" "
Edgard Quinet	13,644	Brest.	Launched Sept. 21, 1907.
Waldeck-Rousseau	13,644	Lorient.	" Mar. 4, 1908.

The *Temps* states that the new French warships will be provided with guns and gun mountings which will be equal to any afloat in other navies. The *Edgard Quinet* and *Waldeck-Rousseau* carry guns in turrets and redoubts, and the six battleships are provided with guns also in turrets, all well protected, while the guns themselves are declared to be the most powerful existing of 45 and 50 calibers length. It has been a reproach to French constructors that the guns have fired at a lower rate than those of other navies, and this may have been true. But, according to the *Temps*, it will no longer be true, the Ministry of Marine having opened a competition amongst French turret builders which has led to many improvements. The turrets of the Forges et Aciéries de la Marine et d'Homécourt have been selected as the best, being for guns of 7.6 inches, 9.4 inches, and 12 inches. Turrets of this class are now being constructed at Saint Chamond and elsewhere. Many details have been modified, and ingenious devices have been introduced which permit rapid loading in any position of the turret, and at all angles, for each caliber of gun. Moreover, there is a special device which enables the gun to be kept laid upon the target, notwithstanding the rolling and pitching of the vessel. The rate of fire for the 7.6-inch guns will be at least four rounds per minute, three rounds for the 9.4-inch and two rounds for the 12-inch. These figures, says the *Temps*, and the weight of metal that they enable to be thrown, speak for themselves, and indicate the formidable offensive power of the new French ships.—*Army and Navy Gazette.*

The three new submersibles *Q64, Q65, and Q66*, under construction at Rochefort, are to be named *Papin, Fresnet*, and *Berthelot;* while the three *Q67, Q68*, and *Q69*, building at Toulon, will be called *Monge, Ampère*, and *Gay-Lussac*. All six vessels, which were laid down at the end of 1905, are of the *Laubéuf type*, with a displacement of 398 tons.—*United Service Institution.*

THE TREASON CASE.—The trial of Naval Sub-Lieutenant Ullmo for communicating secret documents to foreign powers concluded at Toulon on February 22. The following were the questions put to the court, and the answers were unanimous:

1. Had he communicated with a foreign power?—"Yes."

2. Had the information so communicated been made use of or acted upon?—"No."

3. Had he copied secret documents of importance to the security of the State which should not have been in his hands?—"Yes."

The sentence of the court is: That he be transported and imprisoned for

life in a fortress, with military degradation, and to pay the expenses of the trial, the judgment and sentence to be published.—*United Service Institution.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Schleswig-Holstein ..	13,200	Kiel.	Launched Dec. 17, 1906.
Schlesien.....	13,200	Danzig.	" May 28, 1906.
Nassau.....	18,000	Wilhelmshaven.	" March 7, 1908.
Ersatz Sachsen.....	18,000	Bremen.	Building.
" Württemberg	18,600	Stettin.	"
" Baden	18,600	Kiel.	"
" Oldenburg....	18,600	—	To be laid down in 1908.
" Beowulf	18,600	—	" " "
" Siegfried	18,600	—	" " "
Armored Cruisers.			
Gneisenau	11,600	Bremen.	Under trial.
Scharnhorst.....	11,600	Hamburg.	" "
Blücher.....	15,000	Kiel.	Launched April 11, 1908.
F.	17,000	Bremen.	Building.
G.....	17,000	—	To be laid down in 1908.
Protected Cruisers.			
Ersatz Pfeil.....	3,800	Kiel.	Building.
Dresden	3,800	Hamburg.	Launched Oct. 5, 1907.
Ersatz Greif.....	4,300	Danzig.	Building.
" Jagd	4,300	Stettin.	"
" Schwalbe.....	4,500	—	To be laid down in 1908.
" Sperber	4,500	—	" " "

THE ESTIMATES FOR 1908.—The estimates for 1908 amount to £16,966,186, as against £13,923,650 voted for 1907. The following are the principal items:

ORDINARY PERMANENT ESTIMATES.

	Proposed for 1908.	Voted, 1907.
Imperial Ministry of Marine and Naval Cabinet..	£101,719	£94,927
Naval Headquarter Staff.....	15,707	15,466
Observatories, etc.	18,893	18,326
Station Accounts Department.....	34,228	30,897
Legal Department	9,133	8,516
Chaplains' Department and Garrison Schools.....	8,319	6,990
Pay of Officers and Men.....	1,566,159	1,451,533
Maintenance of Fleet in Commission.....	1,821,350	1,559,858
Allowances for Officers and Men.....	115,616	108,818
Clothing	21,825	22,014
Barrack and Garrison Administration, etc.	57,150	48,119
Barrack and Garrison Construction.....	36,545	33,466
Lodging Allowance	135,834	127,852
Medical Department	124,517	115,886
Travelling, Transport, and Freight Charges.....	157,389	170,550
Training Establishments	24,547	24,627
Maintenance of Fleet and Dockyards.....	1,626,658	1,479,926
Ordnance, Arms, and Fortification.....	641,051	559,720
Accountant-General's Department	48,609	46,033
Pilotage and Surveying.....	37,809	36,715
Miscellaneous Expenses	81,217	18,069
Administration of Kiau-Chau Protectorate.....	5,768	5,195
Total	£6,690,053	£6,043,564

SPECIAL ORDINARY ESTIMATES.

Shipbuilding Program for 1908.

For the construction of the following ships:

The first-class battleship *Schleswig-Holstein* (*Q*), 4th and final vote	£117,500
The first-class battleship *Schlesien* (*R*), 4th and final vote	117,500
The first-class armored cruiser *Scharnhorst*, 4th and final vote	75,000
The first-class battleship *Ersatz Bayern*, 3d vote	200,000
" " " *Ersatz Sachsen*, 3d vote	200,000
The first-class armored cruiser *E*, 3d vote	250,000
The third-class cruiser *Ersatz Pfeil*, 3d and final vote	54,500
" " " *Dresden*, 3d and final vote	54,500
Battleship *Ersatz Württemberg*, 2d vote	430,000
" *Ersatz Baden*, 2d vote	430,000
First-class cruiser *F*, 2d vote	450,000
Third-class cruiser *Ersatz Greif*, 2d vote	150,000
" " *Ersatz Jagd*, 2d vote	150,000
Fitting up battleship *König Wilhelm* as a volunteer drill ship, 2d and final vote	10,000
Repairs and alterations to first-class battleship *Hansa*, 2d and final vote	47,500
Tender *Ersatz Ulan*, 2d and final vote	30,000
First-class battleship *Ersatz Oldenburg*, 1st vote	275,000
" " *Ersatz Siegfried*, 1st vote	275,000
" " *Ersatz Beowulf*, 1st vote	275,000
" cruiser *G*, 1st vote	250,000
Third-class " *Ersatz Schwalbe*, 1st vote	125,000
" " *Ersatz Sperber*, 1st vote	125,000
River-gunboat *C*, 1st vote	25,000
Repairs and alterations to first-class battleship, *Kaiser* class, 1st vote	100,000
Repairs and alterations to first-class cruiser *Frederick Carl*, 1st vote	50,000
Repairs and alterations to another third-class cruiser	50,000
Flotilla of torpedo-boats, 2d and final vote	350,000
" " 1st vote	500,000
Repairs to torpedo-boats	20,000
Construction of and experiments with submarines	350,000
Total	£5,716,500
For the gun and torpedo armaments of new ships and mines	2,834,000
Miscellaneous expenditure: Dockyards, etc	439,375
	£8,989,875
From which has to be deducted, credited in the extraordinary estimates	3,220,500
Leaving total	£5,769,375

Summary.

	1908.	1907.	Increase, 1908.
Ordinary permanent estimates	£6,690,053	£6,043,564	£646,488
Shipbuilding, armament, etc	5,769,375	5,011,572	757,802
Extraordinary expenditure	4,506,757	2,868,513	1,638,244
Total	£16,966,186	£13,923,650	£3,042,535

—*United Service Institution.*

The German battleship *Ersatz Bayern* received the name of *Nassau* when she was launched on March 7. Her displacement is said to be about 19,000 tons, and her length has been given as 472 feet, with 82 feet 9 inches beam and 26 feet draft. Her steaming range will be about 5000 miles, and she is to have a maximum speed of 19 knots. As to her armament, considerable doubt attends the statement that she is to receive sixteen 11-inch guns, of which twelve placed in four turrets*—those on the keel line firing over two other turrets each mounting two guns of the same caliber. Another statement is that she will have twelve such guns with twelve 6.6-inch and some smaller. With regard to the rate at which she has been built, it must be understood that for months previous to laying the vessel down vast quantities of material had been made ready, and were alongside the slip. The actual time occupied is alleged to have been seven and a half months, but the launching weight is not given. However, this period considerably abridges that occupied in the case of some other recent ships. From laying down to launching the *Braunschweig* was 14 months, the *Elsass* 17 months, and the *Hessen* about 16 months. There can be no doubt that the Germans are expediting their rate of warship construction by improved facilities at the building yards. At the Germania and Howaldt works at Kiel, at the Vulkan Yard, Stettin, the Weser Yard, Bremen, and the establishment of Blohm & Voss at Hamburg, it has been declared by the authorities of these establishments that "capital ships" can be completed within from 24 to 30 months, and the Schichau firm at Elbing and Dantzic reported practically in the same way.

The German armored cruiser, which has been built at the Imperial dockyard at Kiel under the denomination of *E*, was launched on April 11, and received the name of *Blücher*. The cruiser belongs to the program of 1906. Her characteristics have not been definitely described, but it is known that she displaces about 15,000 metric tons, and that she is intended for a speed of 22.5 knots with 35,000 horsepower. Her maximum protection will be six inches of Krupp steel on the water-line. She will have three sets of compound reciprocating engines and water-tube boilers. It has been said that she will mount eight 11-inch guns and twenty 3.5-inch, but the *Kreuz Zeitung* states that her main armament will consist of 8.2-inch guns.† It is said that her complement will be 24 officers and 767 men. She was launched in a fairly advanced state with rudder and three screws in position, and will be ready for trials early next year. The *Blücher* is of a class not likely to be repeated, for her successors, *F* and *G*, are bigger and are intended for a speed of 25 knots. Another of the big class of battleships will shortly be launched at the Weser Yard, Bremen, being the *Ersatz Sachsen*.

More is now known concerning the German submarine built at the Germania Yard, Kiel. She displaces 224 tons, and is 138 feet long, with a maximum beam of 11 feet 6 inches. Submerged propulsion is by means of an electric motor of 200 horsepower, driving two screws, and giving a speed of 9 knots for a period of three hours. On the surface propulsion is by a petrol motor, with its reservoirs outside the hull in order to avoid dangers of explosion, and the range of action is 1000 miles. The boat sinks and rises by emptying and filling ballast tanks, and by means of two pairs of horizontal rudders. She may descend to a maximum depth of 131 feet, and the change from surface to submarine navigation requires only five minutes. There is a tube for an 18-inch torpedo at the stem, one torpedo being kept in the tube, and two others in reserve. The conning-

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*The inherent disadvantages of three-gun turrets are so great that it seems incredible that the Germans have adopted them.—P. R. A.

†*Le Yacht* gives the battery of the *Blücher* as ten 11-inch guns, four in two axial turrets, four in two side turrets forward and two in two side turrets aft.

tower is armored and has two periscopes. Ventilation has been a subject of special study, and is provided for by electric ventilators on the surface, with a good system whilst submerged.—*Army and Navy Gazette.*

ARMORED CRUISER *F.*—The new cruiser, which was laid down last June at the Weser yard, Bremen, and is known at present only by its official designation of armored cruiser *F*, according to present indications will be the largest armored cruiser afloat. The latest advices give her displacement as 19,000 tons, or nearly 2000 more than that of the British *Inflexible*. She is to be protected by an armor belt 8 inches in thickness amidships, which is one inch more than has been placed at the waterline of the British cruiser. In her outboard profile she will show a long and lofty spar deck, extending from the stem aft for two-thirds of the ship's length, with a freeboard of about 28 feet. Forward on this deck will be a turret mounting two 11-inch 50-caliber guns. Immediately astern and mounted on the superstructure deck will be another pair of 11-inch guns in a twin turret. About 50 feet aft, and mounted one on either beam on the spar deck, will be two wing turrets, each carrying a pair of 11-inch guns. On the after end of the spar deck on the axial line of the ship will be the fifth turret with two 11's, and immediately below this on the quarter deck will be the sixth turret with its pair of 11-inch guns. By this arrangement she will be able to concentrate a fire dead ahead and dead astern of eight 11-inch; while on either broadside the new cruiser will deliver the fire of ten 11-inch guns. Compared in respect of weight of metal thrown, the *Inflexible* could fire 6800 pounds on either broadside as against 7600 pounds thrown by cruiser *F*, and 5100 pounds ahead or astern as against 6080 pounds thrown by the German ship. The *Invincible* is to show a speed of 25 knots with 41,000 turbine horsepower on trial. Cruiser *F* is to show 24 knots with 44,000 horsepower in service.—*Scientific American.*

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Bellerophon	18,600	Portsmouth.	Launched July 27, 1907.
Téméraire	18,600	Devonport.	" Aug. 24, 1907.
Superb	18,600	Newcastle.	" Nov. 7, 1907
St. Vincent	19,250	Portsmouth.	Building.
Collingwood	19,250	Devonport.	"
Vanguard	19,250	Vickers.	"
.....	19,250	Portsmouth.	To be laid down in 1908.
Armored Cruisers.			
Defence	14,600	Pembroke.	Under trial.
Invincible	17,250	Newcastle.	" "
Inflexible	17,250	Clydebank.	Launched June 26, 1907.
Indomitable	17,250	Glasgow.	Under trial.
.....	17,250	Devonport.	To be laid down in 1908.
Cruisers.			
Boadicea	3,500	Pembroke.	Building.
.....	3,500	"	To be laid down in 1908.

THE NAVY ESTIMATES.

ABSTRACT OF THE ESTIMATES.

Votes.	1908-9. Total Numbers.	1907-8. Total Numbers.
I.—*Numbers.*		
A total number of officers, seamen, boys, coast-guard, and royal marines	128,000	128,000

II.—*Effective Services.*

1	Wages, etc., of officers, seamen, and boys, coast-guard, royal marines	£7,129,700	£6,869,700
2	Victualling and clothing for the navy	2,286,400	1,996,400
3	Medical establishments and services	258,700	268,700
4	Martial law	13,900	14,200
5	Educational services	167,000	172,500
6	Scientific services	66,000	65,100
7	Royal Naval Reserves	368,300	418,300
8	Shipbuilding, repairs, maintenance, etc.:		
	Section I.—Personnel	2,936,200	2,549,900
	Section II.—Matériel	4,157,000	3,035,200
	Section III.—Contract work	7,220,700	7,646,000
9	Naval armaments	2,048,700	2,348,700
10	Works, buildings, and repairs at home and abroad	2,306,700	2,758,400
11	Miscellaneous effective services	409,200	401,000
12	Admiralty office	370,200	364,600
	Total effective services	£29,738,700	£28,908,700

III.—*Non-effective Services.*

13	Half-pay and retired pay	£868,800	£837,900
14	Naval and marine pensions, gratuities, and compassionate allowances	1,334,600	1,302,000
15	Civil pensions and gratuities	377,400	370,900
	Total non-effective services	£2,580,800	£2,510,800
	Grand Total	£32,319,500	£31,419,500
	Net increase	£900,000	

STATEMENT OF THE FIRST LORD.

The "Statement Explanatory of the Navy Estimates, 1908-9," has been issued as a parliamentary paper, the following being the more important portions of the document:

SHIPBUILDING AND REPAIRS.

New construction for the year will cost £7,545,202 as against £8,100,000 for 1907-8. The continuous fall in the estimate for new construction from the maximum of £11,654,176 in 1904-5 is thus carried on, and Parliament is asked to vote £4,108,974 less than it was four years ago. Of this sum £7,545,202, £6,795,202 will be spent on the continuation of ships already under construction, and £750,000 in beginning work on ships of the new program, which is composed as follows:

1 battleship (improved *Dreadnought* class);
1 large armored cruiser;
6 fast protected cruisers;
16 torpedo-boat destroyers;

and a number of submarine boats estimated to cost £500,000 in all.

This program suffices for 1908-9; whether and to what extent it may be necessary to enlarge it next year, or in future years, must depend upon the additions made to their naval force by foreign powers. His Majesty's government have every intention of maintaining the standard of the British Navy which has hitherto been deemed necessary for the safeguarding of our national and imperial interests.

Several incidents occurred early in 1907 which gave us cause to suspect that the method of storing cordite in magazines on board ship required

alteration, in order to meet certain dangers that had been discovered to arise from cordite which is exposed to high temperature. The matter did not admit of delay, and the Admiralty decided, with the approval of a strong scientific committee, presided over by Lord Rayleigh, to fit the cordite magazines with cooling apparatus, and to destroy all cordite that had been long in a hot climate. The cooling apparatus is expensive, and the work when completed will have cost £500,000; but the necessity for dealing promptly with the danger will not need further statement. The progress on this work has been very prompt and satisfactory, and the amount estimated for it during the year will be fully spent. The remedy of these defects is nearing completion, and the present progress of repairs is now in a normal and satisfactory condition.

The cost of maintaining the torpedo craft in an efficient condition is increasing as the vessels get older, and many of them are due for large boiler repairs during the present year. Before carrying out this work in the older ones, a careful survey will be made to ensure that they are worth this expenditure. The increasing power of machinery and boilers, due to the higher speeds adopted during the past decade, is also throwing an increasing share of repair work on the engineering side of the dock-yards and necessitating an increase in the numbers of men therein employed, though no corresponding increase is required on the constructive side at present. Although no important reconstructive work is contemplated, many minor but very important alterations are being carried out gradually with the object of improving the general fighting efficiency of the fleet. Wireless telegraphy is being adopted in most of the later destroyers, and the improvements in the system adopted in our big ships have required constructive alterations in them to enable the instruments to be fitted. These alterations require considerable time and money to carry out, in view of the great number of vessels involved.

Excellent work continues to be done by repair ships and the artificers of the fleet in correcting small defects, which might otherwise develop to such an extent as to necessitate dockyard assistance before the annual refit was due; but, nevertheless, for the reasons I have given above, an increased provision of £700,000 for repairs is needed for the coming year.

We have begun to build submarines in the royal dockyards, a step which, besides affording desirable work to them, will be a check on contract prices.

The Admiralty have come to an arrangement with the armor-plate manufacturers for a considerable reduction in the price which is paid for armor plates, and this will take effect in the construction of the new armored ships of the current year's program.

GENERAL PROGRESS OF RECENT REFORMS.

A review of the memoranda issued by the Admiralty during the last few years discloses a series of important changes and alterations affecting all branches of His Majesty's naval service. These are all, in my opinion, entirely well conceived and salutary. Time is now required for the service to digest and assimilate the new arrangements, and caution will, therefore, be used in bringing forward further schemes at present.

Under the nucleus crew system, the chief executive officers and more important ratings are always on board the ships; from time to time the crews are made up to full complement and are given seagoing practice; the boilers and machinery are always maintained in good order, so as to be ready for sudden mobilization. The rapidity and certainty with which the nucleus crew ships can be fully manned has been illustrated signally by the recent exercises of mobilization at Devonport, Portsmouth, and Chatham.

It has been alleged that the Admiralty have no war plans properly worked out, nor strategical operations thoroughly elaborated; this is a baseless allegation. Such plans are in the possession of the Admiralty in

abundant number to meet all probable emergencies. The details of these plans cannot, of course, be made public, for their successful operation in actual warfare must largely depend upon their secrecy.

The new disposition of the Atlantic fleet with its base at Berehaven and its repairing dockyard at Gibraltar, and the development of the home fleet have been notable examples of the progress of the last two years. The fully-manned portion of this fleet at present has its base at the Nore, and is now in full working order, though not up yet to its intended full strength. It will consist this summer of 12 of the latest battleships and armored cruisers, with destroyer and submarine flotillas attached, and the nucleus crew ships at the three home ports ready for rapid mobilization.

The remarkable results which have during the last year been returned of the gunnery practice carried out by our fleets and ships all over the world, are facts of great interest and worthy of congratulation. The reports of the efficiency which signalling has reached in the naval service, whether by the older systems or by electric and wireless telegraphic installations, are very satisfactory and speak very highly for the intelligence and hard work of the officers and men who take charge of this important part of the service of the sea.

The new system of entry, training, and education for all classes of officers in the navy—executive, engineers, and marines—instituted a little more than four years ago, is yielding good results. The first two batches of cadets are now serving in the training cruisers *Cumberland* and *Cornwall*. After six months' service in these cruisers, they will be drafted to ships in the seagoing fleets, the first batch going to sea in April. In the fleets they will be trained in a practical way as naval officers, and after three years they will be examined in seamanship, navigation and pilotage, gunnery, torpedo, and engineering, and in certain subjects, such as mathematics, mechanics, electricity, languages, and history, the study of which at sea will be voluntary. After passing the examinations in the above subjects, they will become sub-lieutenants and remain at sea, receiving their promotion to lieutenant according to the results of their examination. After serving at least two years at sea as sub-lieutenant and lieutenant, a certain proportion will be selected to qualify in the separate specialist branches of the service, in preparation for which they will then undergo courses at the Royal Naval College, Greenwich, and the specialist schools. The officers will thus serve for 5½ years continuously at sea before they can specialize.

The interview committee which, since taking office, I have appointed to report on the respective qualifications of the candidates for entry as naval cadets, have included Admirals of the Fleet Lord Walter Kerr and Sir Edward Seymour, Admirals Sir Archibald Douglas and Sir Arthur Fanshawe, Vice-Admiral Sir John Durnford, the Right Hon. Arthur Acland, Mr. A. C. Benson, and the Headmasters of Marlborough, Wellington, Radley, and Dartmouth. Their reports to me have revealed a most satisfactory unanimity of opinion as to the value and success of this method of differentiating between the merits of boys of the young age of 12 years.

PERSONNEL.

The War Course College at Portsmouth, renamed the Royal Naval War College, has now been placed under the command of a flag officer—Rear-Admiral Robert Lowry—with an increased staff of assistants, and work of the greatest value is now being carried out there, in close connection with the Naval Intelligence Department, whose director, Capt. Sir Charles Ottley, K. C. M. G., has, on appointment as secretary of the imperial defence committee, been succeeded by Capt. Edmond Slade, hitherto superintendent of the War Course College.

The annual battle practice is steadily training the fleet for the firing conditions which would be met with in action. Each year our experience gained increases our knowledge of the practical means of developing the

fire of our ships, and we are continuing to make progress in the direction of imitating more closely the actual conditions of battle. It is difficult to appreciate the revolution in naval gunnery which has taken place in the last few years, and the labor and patience required in introducing large changes throughout a great service like the navy. The results obtained this year have shown that a sound knowledge of long-range shooting has thoroughly permeated the fleet. We are therefore able from the experience gained to take next year several important steps as regards both this practice and additional fitings to the ships. Every endeavor is being made to assimilate our methods to war conditions, but while we are steadily developing, there is no reason to disparage our present results, which undoubtedly afford great proof of the gunnery efficiency of our various ships and fleets, and give a measure of their capabilities in action.

In the four principal fleets the recording of the results was placed in the hands of an independent committee, under the inspector of target practice, to ensure a uniform method of assessing the number of hits obtained by each ship.

WORKS.

The Admiralty property at Rosyth, consisting of 1184 1/5 acres, with 285 acres of foreshore, was purchased in 1903-4 for the construction of a new naval base on the east coast. In the interval, since the completion of the purchase, the superintending engineer appointed in charge of Rosyth has made an extensive survey of all the great naval establishments and building yards at home and of some abroad, in order that plans might be drawn for the laying out of Rosyth as a first-class naval base in such a way that any particular portion might be carried out without interference with the general scheme; the intention was to avoid the repetition of the haphazard growth of a naval dockyard port, which the history of the old establishments at Portsmouth, Devonport, and Chatham has proved to be so expensive in the past. The general scheme having been drawn up, the present Board of Admiralty have decided to take in hand the construction of a graving dock, closed basin, and an entrance lock, capable of accommodating the largest modern warships, with a depôt for submarines and destroyers, and provision for oil fuel storage. The basin is to be 52½ acres in area, with accommodation for 11 of the largest ships along the quays, or 22 when double banked. During the past year the preliminary borings have been completed, and detailed contract plans are now being prepared. This part of the general scheme, for which the contract will shortly be let, is estimated to cost £3,000,000 for work and £250,000 for machinery—the whole to be completed in about 10 years.

COLONIAL CONFERENCE.

The Prime Minister of the Australian commonwealth has communicated to the Admiralty the outline of a scheme for the establishment of a local flotilla of destroyers and submarines, which is now under consideration. The Cape and Natal governments have initiated legislation with the object of establishing divisions of the Royal Naval Volunteer Reserve in Cape Colony and Natal, and the legislature of the latter colony has passed an act for the purpose.

DISTRIBUTION OF THE FLEET.

The distribution of the fleet has undergone no material alteration. The development of the home fleet is steadily proceeding, and by degrees approaching its desired standard of strength.—*Army and Navy Gazette.*

FURTHER EXTRACTS FROM THE FIRST LORD'S STATEMENT.—*Administration.*—A reform long advocated by naval officers has been carried out this year by the transfer of the work of making contracts for naval guns and ordnance stores from the War-office to the Admiralty and by the creation of a Naval Ordnance Inspection Department. The Admiralty, therefore,

now for the first time have direct control and responsibility for the manufacture and supply of the guns and ammunition of the fleet. The army inspection officers have done the work for the Admiralty with great ability in the past, but the growing divergence in pattern between the stores required by the two services and the necessity for the rapid expansion of the supply in war time, a requirement for which the War-office Staff were admittedly unable to provide, rendered the change inevitable.

Works.—After negotiations extending over a good many months, a site has been feued on the west shore of Loch Long for the establishment of a torpedo range of 7000 yards length, and another has been purchased at Greenock for a torpedo factory, whence these weapons can readily be conveyed to the range for trial. The rapid increase in recent years of the speed and the range of action of the Whitehead Torpedo has rendered the existing ranges at Portsmouth and Weymouth wholly inadequate for their purpose.

ORDNANCE.

Guns.—The system of examining and proving heavy guns at contractors' works, which was inaugurated in 1906, is being continued with satisfactory results.

Cordite.—It has been found that the temperature of the magazines of ships tends to reduce the life of the cordite stored in them. It has, therefore, been decided to cool artificially the cordite magazines on board ship. The regulations for the periodical testing of cordite have been made more stringent, and in future, under the improved storage conditions, the safe age limit for cordite should be considerably increased. This increased inspection will enable cordite to be more closely watched, and any that is approaching its age limit will, so far as possible, be issued for practice purposes to the fleet. Considerable saving will, it is hoped, thus be effected.

Hydraulic Mountings.—Experiments have been continued with satisfactory results to improve the ease of manipulation of heavy power-worked mountings. The trials of the hydraulic gun mountings of the latest ships have been successful and the newest designs embody further improvements which, it is hoped, will give greater rapidity and accuracy of fire.

The older types of 12-inch mountings in those battleships which may reasonably be expected to remain efficient fighting units during the next decade are being brought up to date so far as the original design will admit, so as to approximate to the later types in the principles of sighting and manipulation.

Other Mountings.—A heavier and more powerful type of anti-torpedo-boat gun and mounting has been introduced as the standard gun for this service in the battleships and armored cruisers now under construction.

Field Mountings.—Heavier and more powerful field guns and carriages, with improved sighting arrangements, are now under construction for the fleet.

Sights.—Arrangements have been made to bring the sighting arrangements of all ships up to date.

Fire Control.—The fitting of fire control instruments in existing ships has been proceeded with, and will be practically completed this year. The supply of improved range finders to the fleet has been continued, and will be further extended next year.

Diving.—The diving committee formed last year have completed their investigations of the difficulties attending diving in deep water and much practical information has been obtained.

Torpedoes.—Satisfactory advance has been made in developing the speed and range of torpedoes; experiments are still in progress.

Wireless Telegraphy.—Considerable progress has been made both in the apparatus and in the provisions and training of operators. Instruments of an improved design will very shortly be fitted in a large number of ships. The strategical exercises carried out during the year have shown that a

considerable advance has been made in the reliability and utility of this system of communication.

FUEL OF THE FLEET.

Arrangements have been made to provide a number of sets of apparatus for coaling H. M. ships at sea.

A vessel has been purchased for the conveyance and supply of petroleum spirit in bulk to submarines.

Steps have been taken to commence the provision of stocks of oil fuel at ports around the coast to meet the wants of oil-burning ships.

Progress has been made in the installation of improved mechanical appliances for the more rapid handling of coal.

NEW CONSTRUCTION.

Battleships.—The three improved *Dreadnoughts*, the *Bellerophon*, *Téméraire*, and *Superb*, have been launched and have made satisfactory progress.

Alterations have been carried out in the *Dreadnought* as a result of the experience gained during the experimental cruises, and the improvements suggested have been embodied, where applicable, in the new ships of the class.

The designs of the new battleships for this financial year have been completed, and full advantage has been taken of the experience gained in the *Dreadnought*, and of the reports received from her officers.

All necessary preliminary work in connection with building the *St. Vincent* at Portsmouth and the *Collingwood* at Devonport has been carried out, and the vessels have been laid down in December and February respectively. The third battleship, to be named the *Vanguard*, which is to be built by contract, is about to be laid down at Barrow.

Armored Cruisers.—The three great cruisers of the *Invincible* class are approaching completion, and should be ready for commissioning early in the next financial year.

The *Warrior* has been completed, and has joined the home fleet, so that all four vessels of her class are now in commission.

Of the later class of cruisers the *Minotaur* and *Shannon* have successfully passed through their trials, and will be completed for sea about the end of this financial year. The third ship of this class, the *Defence*, has been launched at Pembroke, and is being prepared for her trials.

Unarmored Cruiser.—The keel of the *Bodicea* was laid at Pembroke on July 1, 1907, and it is hoped to launch her in April, 1908.

Destroyers and Torpedo-boats.—Of the 12 first-class torpedo-boats—formerly classed as "coastal destroyers"—which were ordered during the financial year 1906-7 some have begun steam trials and the rest will shortly be ready for them; it is expected that four will be delivered during the current financial year. Orders have been placed for the 12 boats of the same type provided for in the program for 1907-8. They are repetitions of those previously ordered as regards general features, but embody improvements in details which experience showed to be desirable.

Of the five 33-knot torpedo-boat destroyers ordered during 1905-6 four have obtained the contract speed and the fifth will soon undergo her official trials. These vessels are of an entirely new type, and their novel character has involved much careful attention in working out details. The time expended in this direction has resulted in the contract speed being exceeded in three vessels by from ¾ to 2¼ knots. The two similar vessels ordered in 1906-7 will now be advanced as rapidly as possible by their builders in view of the actual experience obtained with the previous vessels.

MACHINERY AND BOILERS.

The *Agamemnon* and *Shannon* have been fitted with large tube boilers of the Yarrow type, and the *Minotaur* with boilers of the Babcock and

Wilcox type. Small tube boilers, designed to burn oil fuel only, have been fitted in the torpedo-boats and torpedo-boat destroyers.

Three effective old first-class torpedo-boats have been re-boilered with boilers of water-tube type in lieu of those of locomotive type with which they were originally fitted. Water-tube boilers for the remainder of these boats, in which this substitution has not been carried out, have been completed and will be installed during the remainder of this financial year or during 1908-9.

The capacity of the electric generating machinery in ships of the *King Edward VII* and other recent classes is being increased by the provision of additional machines, in order to cope with the more extended application of electrical power in these vessels.

The question of the suitability of automatic stoking apparatus for boilers using coal in H. M. service afloat has been given consideration, and a trial is now proceeding in a gunboat.

Turbine Propelling Machinery.—All war vessels at present under construction are being fitted with machinery of this type, which has, without exception, proved very successful in the vessels which have been so fitted up to the present time. The type of marine turbine propelling machinery hitherto fitted or now being fitted in H. M. ships is that known as the Parsons type. The development of other types of marine propelling turbines is being closely watched, in view of their adoption in some foreign navies.

Liquid Fuel.—During the year oil burning appliances, as auxiliary to coal, have been completed and tried in the armored cruisers *Cochrane, Achilles, Natal,* and *Warrior,* with satisfactory results. The first group of 12 torpedo-boats fitted to burn oil only still continue to give satisfactory results on service.

All armored vessels now under construction are being provided with arrangements for burning oil in conjunction with coal, and all torpedo craft for burning oil only. The four new destroyers of the *Mohawk* class, which have carried out their full-speed trials, used oil fuel only, and their installations have proved satisfactory.

Installations in the *Majestic, Cæsar, Magnificent,* and *Victorious* to burn oil and fuel together are being completed.

Experimental and instructional work in the burning of oil fuel has been continued at Haslar and in the *Fisgard IV* with various types of boilers, and also in the destroyers *Spiteful* and *Surly.*

Special arrangements have been made in the instructional classes at Portsmouth and in the fleet with the object of increasing the rate of instruction in this subject, and are proving satisfactory.—*The Engineer.*

EXPLANATORY STATEMENT BY THE FIRST LORD.—It is proposed to lay down six cruisers of an intermediate character this year. One of these cruisers is to be an exact replica of the *Boadicea,* which will be launched in May, and the new one will be laid down very shortly afterwards. The design of the other five cruisers has not yet been finally decided upon. The *Boadicea* is a vessel of 3500 tons, and the new cruisers will probably run from 4000 to 5000 tons. These ships will be extremely useful for acting as the scouts and eyes of the fleets. They will have considerable coal endurance, and will be able to keep at sea for a considerable time. They will also be fast ships, of 23 or 24 knots.

Answering criticisms by Lord Cawdor on the provision of destroyers, Lord Tweedmouth gave the following comparison of the British and French and German fleets in home waters on March 31 of the present year. We have now ready ocean-going destroyers of 33 knots, four; *River* class, 34; of 30-knot destoyers, 48; of 27-knot destroyers, 28; of coastal destroyers, 15; making a total of 129. As a matter of fact we have 142, but 13 of these are at present under repair. Germany at this moment has 57 destroyers, 10 divisional torpedo-boats—altogether 67. The French have

26 destroyers; making a total for the two countries of 93. This does not make any allowance for any of the German or French boats being under repair, as we may be certain they are; but if we take the same proportion as that which is to be found among our own destroyers we shall find that Germany and France have only 85 destroyers ready as compared with the 129 destroyers of Great Britain. As to destroyers of 11 years and under, our own figures are: Ocean-going, 4; *River* class, 34; 30-knotters, 47; coastal destroyers, 15; making a total of 100. The Germans have 57 destroyers and one divisional torpedo-boat, 58 in all; the French have 26 destroyers. We have 100 destroyers under 11 years in home waters. With respect to new destroyers, the government is going to lay down 16 which will be of the type of the latest *River* class still further improved. This year also they are devoting £500,000 to the construction of submarines. —*Page's Weekly.*

THE LOSS OF THE TIGER.—A court-martial inquiry into the loss of the *Tiger*, t.-b. d., was held on April 10 and 11, on board the *Victory*, at Portsmouth.

In his circumstantial letter, Rear-Admiral A. M. Farquhar stated that Capt. J. Nicholas, of the *Hecla*, intimated to him that he would like the torpedo flotilla to attack the Portsmouth division of the home fleet on its passage to Portland. He acceded to the request. For two hours the ships exercised maneuvers, and proceeded at six knots in single line ahead until 7 p. m. The ships had been instructed to have all lights screened, and they then proceeded at 10 knots towards Portland. He had noticed the torpedo-boats inshore, and expected an attack. The searchlights were not laid on the boats, as he considered that the boats could be located without their aid. At 8.15 p. m. the night was quite dark, but clear, and at that time he noticed two destroyers pass down and on the starboard side of the *Prince George*. He allowed no lights to be switched on, because he desired to avoid dangerously dazzling the boats. His attention was called to the accident by the loud roar of escaping steam and a flash of light. Admiral Farquhar went on to state the orders he gave as to ships standing by to pick up any survivors, and for the *Berwick* and *Gladiator* to proceed to Spithead.

The evidence having been concluded, the court, after a lengthy deliberation, announced the following finding:

"The court, having called before it all persons who it considers could throw any light on the circumstances of the collision between the *Tiger* and *Berwick*, and having carefully considered their evidence, finds as follows: That his Majesty's ship *Tiger* was engaged on the night of April 2, 1908, in making a pre-arranged night attack, no lights being shown on the ships of the Portsmouth division home fleet on their way to Portland; that the *Tiger* was working with the *Recruit*, the latter being the leader, and that about 8.15 p. m. these two vessels attacked from ahead on the port side of the battle squadron which the *Prince George* was leading; that a short time after passing the *Prince George* the *Tiger*, instead of following her leader, altered her course to port, which brought her across the course of the *Berwick*, by which she was rammed and cut completely in half, both portions sinking after a few minutes.

"The court further finds that no blame can be attributed to any surviving member of the crew of the *Tiger;* that there is no evidence to show why she altered her course to port instead of following her leader, and as there is no evidence on this point the court considers that no blame can be attributable to any deceased member of the *Tiger's* crew. The court is, however, of opinion that the *Berwick* must have been visible from the *Tiger* when she altered her course to port.

"The court further finds from the evidence it has had before it that no blame is attributable to any other person for this lamentable accident, and that there was no sufficient time from the time of the *Tiger* being sighted from the *Berwick* for the latter to have avoided or prevented the collision.

"The court further considers that when the collision was seen to be inevitable all proper steps were taken aboard the *Berwick* to lessen the shock of the collision and to save life."

The fact that the court-martial on the loss of the *Tiger* was held under the new rules which came into force on the first of the month is interesting. By Articles 662 and 662A in the revised regulations provision is made for summoning courts-martial "to inquire into the loss, etc., of ships where no specific charge is made; but it is laid down that a court-martial shall not be summoned under the provisions of Sections 91 and 92 of the Naval Discipline Act unless there is no reasonable ground for supposing that any one or more of the survivors are to blame. In all other cases of loss, etc., specific charges are to be prepared, and the convening authority must appoint a prosecutor and direct him to prepare a circumstantial letter." Until this alteration was made, it was necessary, under the provision of the two sections mentioned, to try either all the surviving officers and crew or, in the alternative, those who were assumed to have been more or less responsible for the loss of the ship. Section 91 reads as follows:

"When any one of his Majesty's ships shall be wrecked, or lost, or destroyed, or taken by the enemy, such ship shall, for the purposes of this act, be deemed to remain in commission until her crew shall be regularly removed into some other of his Majesty's ships of war, or until a court-martial shall have been held, pursuant to the custom of the navy in such cases, to inquire into the wreck, loss, destruction, or capture of the said ship."

This section of the Naval Discipline Act had a curious origin, to which our attention has been drawn by Mr. David Hannay. In the expedition of Commodore Anson, which left St. Helens for the Pacific in September, 1740, one of the ships, the *Wager*, commanded by Captain David Cheap, parted company with the commodore in a gale off Cape Horn in April, 1741. Off the coast of Chile, in May, this ship was wrecked, but the crew got ashore. There the men declared, that, as according to the regulations of the time as soon as the ship was lost their pay ceased, they were no longer amenable to naval discipline. In the mutiny that followed the captain shot a midshipman named Cozens; whereupon the crew deposed him, and taking three of the boats deserted with the intention of going home. A lieutenant of marines, the surgeon, and seven men remained with the captain, and soon afterwards two midshipmen and eight more men, who were also faithful, managed to elude the mutineers and returned. One of these midshipmen was the Hon. John Byron, and the other Alexander Campbell, both of whom wrote narratives of their adventures when they got back to England. When, however, it was proposed to proceed against the mutineers, the law officers reported that such proceedings would be illegal, as the men were right in their contention. Steps were then taken to introduce the section we have quoted in the articles of war, and until the court-martial held last week it has been the rule to try the survivors, even although, as in the cases of the *Captain* and *Eurydice*, none of them could be likely to be responsible for the loss of the ship.—*Army and Navy Gazette.*

The report of the committee appointed to inquire into the cooking arrangements of the Royal Navy has just been issued. From this it would appear that defects in the present system have been clearly established, attributable chiefly to the long-established custom of entrusting the preparation of food before it reaches the galley to the men told off to act as cooks to their respective messes. As the health and comfort of the crews of the fleet depend largely on the proper cooking of the food, the Admiralty came to the decision that experiments should be made of having all the food for the ship's company prepared and cooked by qualified cooks. Accordingly experiments were made on these lines in certain vessels specially selected for the purpose, and the reports from these particular ships have proved so favorable that the Admiralty have now come to the conclusion to adopt

the system generally throughout the navy, and to provide in every ship, as soon as sufficient ratings are available, an adequate and properly trained staff of cooks, by whom the whole of the food will be prepared and cooked without assistance from the ship's company, except in the performance of purely manual and unskilled work.

As a result of this report, the Admiralty have issued a memorandum to the fleet, explaining the arrangements which will be made in future to supply trained ratings to ships, as soon as they become available. In order that proper control may be exercised over the cooking staff, it has been further decided that the cooks and their mates shall, in future, be under the general supervision of the accountant officer, and in view to providing for the necessary training of accountant officers, monthly courses of cookery will be established, to be held at the National Training School of Cookery, in London, to which paymasters will be appointed.

The Admiralty have also directed that commanding officers of ships are to detail a lieutenant to go round the mess decks daily when the dinners are served. This officer is to ask if there are any complaints as to dinners, and he is to see that the messes are aware of any men being away on duty, on watch, in the boats, etc. Care is to be taken that his visit does not interfere with the general comfort of the men during the dinner hour. The memorandum also lays down the new scale of pay, titles, pensions, and other matters concerned with the entry and advancement of the cook ratings, and the inducements held out to attract a suitable class of candidates.—*United Service Gazette.*

GUN ROOM OFFICERS' MESSING.—In the King's Regulations and Admiralty Instructions it is stated in Article 831 that "the wine bills of gun room commissioned officers are never to exceed £2 a month; those of other gun room officers, over 18 years of age, 15s. a month; and those of gun room officers under 18 years of age, 10s. a month. No subordinate officers under the age of 20 are to be allowed spirits." The authorities have recently had under their consideration the question whether, in the case of members of gun room messes, permission should be given for amounts unexpended under the above regulation to be used to augment the amount which may be expended on extras, and they have now approved of this being done. Article 835 reads as follows: "In the ward room the monthly mess subscription is not to exceed £3. In the gun room the monthly mess subscription is not to exceed 30s.; but, in addition to this sum, 5s. may be charged for replacing mess utensils and other necessary expenses, and the following sums may also be allowed for extras should a member choose to indulge in them: Commissioned officers, £1 a month; other members, 10s. a month." To this has now been added the words: "And, in addition, the difference between their wine bills and the *maximum* prescribed by Article 831, Clause 5."—*United Service Gazette.*

NAVAL QUESTIONS IN PARLIAMENT.—Mr. E. Robertson states that it is not desirable in the public interest to give any detailed information as to the stock of cordite, but it is at least as large as on January 1, 1907. In reply to a further question in reference to the refusal of the Board of Admiralty to state the amount and value of the large quantity of cordite which had been destroyed because of the presence of mercuric chloride, whether the board had furnished or proposed to furnish the auditor-general with the information, and whether the reserves of ammunition were at once brought up to compensate for these unexpected losses, Mr. Robertson states that no cordite has been destroyed because it contained mercuric chloride.

The number of officers and men of the engine-room department borne on March 31, 1876, was 5118; the number likely to be borne on March 31, 1908, cannot be stated with precision, but the latest returns available give a total of 35,849.

An order in council of July 11, 1905, empowers the Admiralty to transfer to the active list lieutenants in the Royal Naval Reserve who particularly distinguish themselves while employed in the fleet.

The annual cost in full commission of the following classes of vessels, taking interest at 3 per cent and allowing for interest, depreciation of capital, wages of officers and crew, and a proportionate charge for pensions, repairs, and renewals, and other necessary items, and also assuming a life of 20 years in the case of the battleships, and 10 years in the case of the t.-b. d.'s and first-class t.-b.'s, respectively is as follows: First-class battleships, £231,500; t.-b. d., £17,500; first-class t.-b., £6100.

The total number of auxiliary engines on board one of our modern battleships reaches 364. Of these approximately 74 per cent are under the charge of the gunnery and torpedo lieutenants. The total horse-power the whole number could utilize at full power is 15,100. In the case of the *Alexandra*, completed in 1877, the number was 37, and the total horsepower they could utilize 1720.

OFFICERS COMMANDING TORPEDO CRAFT.—It is announced in a circular letter, dated March 28, that the Admiralty have decided that in future all officers who may apply to be selected for command of t.-b. d.'s and t.-b.'s shall be required to pass a practical examination at the Navigation School before being considered. The following is the synopsis of the examination which the officers will be required to pass:

1. Chart work.—(*a*) Ability to read a chart; (*b*) fixing by terrestrial objects by all methods; (*c*) laying off courses, allowing for tides; (*d*) use of danger angles; (*e*) use of leading and clearing marks; (*f*) method of utilizing soundings when navigating in fog.

2. Tides.—(*a*) Practical use of tidal atlases; (*b*) ability to find time of high-water at any place; (*c*) ability to find depth of water at any spot at any time of tide.

3. Uniform system of buoyage.

4. Practical use and management of sounding machines supplied to torpedo-boat destroyers.

5. Compasses.—(*a*) Care and management of liquid compasses; (*b*) method of obtaining and applying the deviation of the compass; (*c*) how to swing ship and analyze a table of deviations; (*d*) how to correct the semi-circular deviation.

6. Mooring board. The following problems: (*a*) To form on a moving ship; (*b*) to obtain the course and speed of an enemy from a distance.

7. Astronomical navigation.—To be able to fix the ship's position by the use of summer lines (optional new navigation).

The maximum of marks given is 500, and three-fifths will be required to pass. These regulations will come into force at once, and after September 1 of this year no officer will be appointed in command unless he has passed in practical navigation.—*Army and Navy Gazette.*

Although there have been no maneuvers on a large scale this spring such as took place off Lagos in February of last year, all the fleets are starting out on exercise cruises, and there are rumors of combined operations in the summer. The Channel fleet and First Cruiser squadron left this week for a month's cruise round the coast of Ireland and Scotland, and will return to Portland on April 29. Berehaven, Killary, Lamlash, Cromarty, and Queensferry, as well as other places, are to be visited, and during the cruise 13 days will be spent at sea and 37 in harbor. As out of the 13 days at sea there are 12 half days leaving or approaching port, the squadron will not have a very long period for exercises under way; although, therefore, this is called a "war training" course, the greater part of the training must be done in harbor. The Nore division of the home fleet also left Sheerness on Monday for an exercise cruise, and will return to that port on April 2. The cruise will last 24 days, of which 17 are to

be spent at sea, including six days in entering and leaving port, and seven days in harbor. During the days at sea the force is to engage in mining, gunnery, and torpedo exercises. The Nore division is a very workmanlike little force, consisting as it does of four battleships, four armored cruisers, two linking ships for the fleet, the *Dido* and *Charybdis*, four gunboats, a mine-layer, repair ship, and hospital vessel, while in addition there is Commodore Bayly's flotilla, the cruiser *Topaze*, two scouts, and 24 destroyers.—*Army and Navy Gazette.*

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Roma	12,625	Gov't Yard, Spezia.	Launched Apr. 21, 1907.
Napoli	12,625	" " Naples.	" Sept. 10, 1906.
Vittorio Emanuele	12,625	" " Castellamare.	Under trial
A	19,000	" " "	Building.
B	19,000	.....	To be laid down in 1908.
Armored Cruisers.			
San Giorgio	10,200	Gov't Yard, Castellamare.	Building.
San Marco	10,200	" "	"
Pisa	10,200	Orlando Works.	Launched, Sept. 15, 1907.
Amalfi	10,200	Odero Works.	" May 5, 1908.
B	10,200	Leghorn.	Building.

ESTIMATES FOR 1908-9.—The Italian Navy estimates for 1908-9 amount to £6,092,000, being an increase by more than half a million over the consolidated estimates sanctioned by the law of 1905. Of this additional sum, £400,000 are for naval construction, and the rest for an increase of 1000 in the *personnel*, though the total increase on this head will be 2881, and the men are to have longer training at sea. For naval construction and maintenance the estimate is £2,630,904. Two battleships of the *Dreadnought* type are to be laid down, and nearly £500,000 will be spent upon them during the year. The Budget Committee advocates the laying down of a third ship as soon as possible, and urges the great necessity of accelerating construction. Unfortunately for the Italian navy, six or seven years have been required to complete a battleship. There is practical unanimity in the Chamber as to the necessity of increasing the fleet. Provision is made for the completion of the battleships *Roma* and *Napoli*, the construction of the armored cruiser *San Marco*, the laying down of a despatch vessel, the beginning of a floating-dock for submarines, and the building of auxiliaries, a tank ship, two lagoon gunboats, a cruiser not described, and some small vessels. It is expected that the *Napoli* and *Roma* will be commissioned in the spring of next year. The armored cruiser *San Giorgio* will be launched next June and the *San Marco* before the end of the year.—*Army and Navy Gazette.*

The *Yacht* states that battleship *A* has just been begun at Castellamare, and that a sister ship *B* is to be laid down before the year is out. The dimensions of these ships are 19,000 tons, 154 meters length and 21.34 meters beam. They are to have 24 knots speed.

ARMORED CRUISERS.—The *Pisa* and *Amalfi* differ from the *San Giorgio* and *San Marco* by having three smoke stacks forward of a single mast instead of four stacks between two masts. The following are the general characteristics of all four ships:

Displacement	10,118 tons
Total length	140.50 meters
Greatest beam	21.06 meters.
Freeboard at center	5.00 meters.
Normal draft	7.18 meters.
Maximum draft	7.43 meters
Metacentric height	1.20 meters

Horsepower	19,000
Speed	22.5 knots
Width of belt	2.27 meters.
Thickness of belt	8 to 3¼ inches.
Armored deck	1 inch.

Their armament consists of four 10-inch 45-caliber guns in two axial turrets, the height of gun axes above the water being 7.6 meters, and eight 7.5-inch guns in pairs in side turrets, gun axes 6.95 meters above the water. Besides these there are sixteen 3-inch guns, eight 3-pounders. Also three submarine torpedo tubes of 45 centimeters.—*Le Yacht.*

ITALY'S PROGRESS IN SUBMARINE NAVIGATION.—It is not commonly recognized how rapid and brilliant have been Italy's strides in the direction of submarine navigation. While most other nations engaged in like work have permitted a good deal of spectacular publicity, Italy has gone along in a quiet and unobtrusive manner with some experiments that have quite revolutionized the accepted standards in this fairly new branch of naval architecture.

From the first Italy has stood for the submersible, and the boats now possessed by Italy are typical of all that is best in this particular type of under-water craft.

The *Delfino* was the first of Italy's modern submarines. She was built in 1889. At that time she was a cigar-shaped craft, propelled by electricity, and fitted with two 14-inch torpedo tubes. Her speed on the surface was not more than five knots, and when submerged she could not exceed a speed of two knots. To enable the boat to sink on an even keel, and, in fact, to control her submergence, she was fitted with a couple of propellers set in vertical tubes running through the boat, somewhat after the plan adopted by Nordenfelt in his boat built for the Russian government—generally known as *Nordenfelt IV.*

From 1889 until 1901 the *Delfino* was used for extensive experimentation. In 1902, or thereabouts, the *Delfino* underwent extensive improvements in a number of directions. As originally built, her upper-hull plating was made considerably heavier than the rest of her spindle-shaped body. This heavy hull-plating was removed, and a great saving in weight thus effected. Up-to-date accumulators were installed in place of the old battery, and explosion motors were provided for the purpose of supplying power for surface propulsion. The spindle-shaped hull had proved an undesirable form for surface navigation, and to make the boat more weatherly she was fitted with a superstructure. Thus modified and modernized, the *Delfino* possessed a surface speed of 8 knots, and a submerged speed of something over 6 knots. Two 18-inch torpedo tubes supplanted the two old 14-inch tubes, and altogether the *Delfino* has since shown herself to be an efficient and reliable craft.

The valuable information secured in the gradual evolution of the *Delfino* formed the groundwork upon which Engineer Cesare Laurenti worked in designing his boats of the *Glauco* type, which were launched successively in 1905, '06, '07. These vessels are 118 feet long, have a maximum beam of a trifle over 13 feet and a surface displacement of 150 tons. They are said to have developed a speed of 14 knots when running light upon the surface and a speed of 8 knots when running submerged. In the summer of 1906 these boats took part in the Italian naval maneuvers, and their performance was highly satisfactory. Their part consisted principally in making attacks upon anchored ships guarded by a large flotilla of torpedo craft. The *Glauco* and *Squalo*, while running at depths of from 10 to 20 meters, experienced no difficulty in passing through the narrow strait of San Vito and reaching the anchored battleships without once being detected by the guarding flotilla. These achievements, and the facility with which the boats were handled after only a short period of training on the part of their crew, gave the amplest evidence of the degree of perfection

reached in their design and construction. It is the best sort of proof that the submerging boat in contradistinction to the diving boat is by far the easier craft to learn to handle; and this point has an important bearing upon the wartime usefulness of such vessels, when rapid changes or substitutions in the crews may become necessary. An Austrian technical journal, commenting upon the performance of the *Glauco* and *Squalo* during the Italian maneuvers, had this to say:

"The results achieved with the submarine boats at Taranto have confirmed the trials made with these vessels at Venice, and have shown that they are capable, especially by night, of approaching moored objectives and getting within an effective firing range of 800 m. Furthermore, the performances at Taranto have also proved that the Italian submarine craft possess exceptional firing apparatus for their torpedoes; and, in fact, it may be rightly claimed that the Italian Navy has made more progress in submarine navigation than any of the other first-class Powers, not even excepting France."

Coming from an Austrian critic, this praise is very significant, because, when not acting upon the defensive, these Italian submersibles could have for their objective no other purpose than to attack the Adriatic ports of Austria.

In addition to the *Glauco* and *Squalo*, the Italian government now has three other sister ships, namely, the *Narvalo, the Otaria*, and the *Tricheco*. With these vessels the Italian government has been recently carrying on a further series of experimental maneuvers.

Engineer Laurenti now has other boats under construction for the Italian government, as well as for some northern countries. These boats are being built at Spezia, at the shipyard of the Fiat San Giorgio, the latter yard having gone in for specialization in the matter of submersible torpedo-boats.

Some very interesting details regarding these vessels have leaked out, and this material is well worth reproduction. The following are their principal dimensions and general characteristics:

Length over all	139 feet 4.5 inches
Beam, extreme	16 feet 10 inches
Freeboard (hull)	3 feet 11.25 inches
Freeboard (hatch coamings)	5 feet 4.75 inches
Freeboard (to top of conning-tower)	10 feet 9.75 inches
Draft (surface trim)	6 feet 10.5 inches
Displacement, surface, when fully laden	180 tons
Displacement, submerged	230 tons
Safety drop keel	12 tons
Reserve buoyancy in light condition	60 per cent of displacement
Metacentric height, surface trim	19.6 inches
Metacentric height, submerged	11.8 inches
Number of bulkheads	8
Hull designed to withstand submergence to depth of	150 feet
Maximum power of explosion motors	750 horsepower
Maximum power of electric motors	190 horsepower
Number of propellers	3
Surface speed, maximum	15 knots
Submerged speed, maximum	9 knots
Surface radius of action at 8 knots speed	875 nautical miles
Submerged radius of action at 5 knots speed	40 nautical miles
Total fuel capacity	296.6 cubic feet
Compressed air in reserve, at 2100 lb. pressure per square inch	13,773 cubic feet
Number of air compressors	2
Number of centrifugal pumps (for water ballast)	2

Each pump can discharge 130 tons per hour at a depth of 130 feet.

Each pump is driven by a special motor.

(1) *Speed.*—The best French boats do not exceed a surface speed of 12 knots, and this applies to vessels of 400 tons. The British boats of 300 tons of the *C* class make only 13 knots. It will thus be seen that the Italian boats have accomplished a great deal more on a very moderate displacement.

(2) *Reserve buoyancy.*—The Italian boats, when running in light trim, have a reserve of buoyancy of 60 per cent of their displacement. The French under-water craft of the *Aigrette* type have about 20 per cent reserve buoyancy. The Lake type have 22 per cent, while the general run of the Holland boats have hardly 10 per cent. Even when water is admitted to the superstructure, the Italian boats retain a reserve of buoyancy of 30 per cent. It will thus be seen how seaworthy these vessels should be, and what a large margin of safety they have against damage due to collision or any shock producing leaks.

(3) *Stability.*—The Italian boats stand quite alone in the point of considerable metacentric height when submerged. As has been said, the metacentric height in that condition is nearly 12 inches. In the large English boats of 300 tons displacement, the metacentric height is only 9 inches, while in boats of the lake type and *Protector* class it is only 7.2 inches.

(4) *Submerged Navigation.*—The Italian boats can be submerged at once, and on an even keel, after a brief preparation in trimming from surface condition. The time required to adjust water ballast for this purpose is only five minutes. The boats retain a positive buoyancy, and submergence is effected by means of two special propellers, which force the boats vertically downward. The various other submarine vessels in existence can be submerged only when underway if retaining a reserve of buoyancy. The Holland boats submerge when underway at an angle of 10° to 12° until the desired depth has been reached. This depth, however, can only be maintained by the exercise of great care and skill on the part of the operator at the horizontal rudder. Therefore, submerged navigation in shallow water at high speed with boats of the diving type is a very dangerous operation. The Italian boats run submerged with a change of longitudinal trim of not more than 1° to 2° at the very most, and with a variance in vertical movement of less than 20 inches.

(5) *Motive Power.*—The Italian boats are driven by three propellers. The middle screw serves for cruising purposes, while all three are in motion when running at full speed. For submerged navigation the side screws only are operated. When running at cruising speed, the central screw alone is used at full power. The accumulators, themselves, are small and handy. The weight of one unit amounts to only about 250 pounds. Their removal in case of accident is therefore much facilitated. With the heavy cells carried by the lake and Holland boats, this operation is a most difficult one, because each cell weighs not less than 1200 pounds. The battery is hermetically sealed, and the gases developed are expelled outboard by special means. Hence the danger of an explosion by reason of these gases—which has been proved fatally great in some other submarines—is accordingly greatly reduced in the case of the Italian boats. The explosive motors are driven by benzine. Up to the present time this is the only fuel permitting the construction of light motors of sufficient power to produce high speed. The manner of stowing the benzine and arranging its feed to the motors are such that no annoying features have manifested themselves at any time since these vessels were put in active service.

(6) *Division by means of bulkheads.*—The interior of the Italian boats is divided into eight separate water-tight compartments. In this feature the Italian boats are distinctly unique. This divisioning makes it possible to seal hermetically and divide the engine-rooms from the remaining divisions, and, by so doing, preventing the heat and any possible gases from the engines spreading into the other parts of the boats when submerged. Submergence is not delayed until the engine space has cooled

down. It is simply closed at once and allowed to take care of itself until the boats are ready to return to the surface and to resume there propulsion under engines. Furthermore, the safety of the craft is considerably augmented by this system of sub-dividing. The serious accidents that befell the French and English submarines showed plainly the need of sub-dividing by means of water-tight bulkheads. During the last Italian maneuvers the submarine boat *Squalo* continued to run submerged, despite the fact that she carried more than a ton of water in her engine room, which had gained admission there by reason of a defective valve of the water-jacket of the motors. The American submarine *Shark* lost her reserve buoyancy through a leak in her engine exhaust valve, and very narrowly escaped going to the bottom in 1904. In the case of the *Shark*, only a few pounds of water thus leaked into the vessel, yet it was enough to imperil her.

(7) *Torpedo firing tubes.*—The Italian boats carry two bow torpedo tubes with their forward ends so formed that they offer but very little resistance to the water. These torpedo tubes, which are capable of carrying 18-inch torpedoes, are so placed that they lie somewhat back and below the stem, so that they are safeguarded in case of bow-on collision.

(8) *Hull.*—The hulls of the Italian boats are not formed with the customary circular cross-section with a superstructure. They are built upon a patented system, and in form are quite like the ordinary torpedo-boat. Apart from giving the vessels easy lines for surface speed, this particular construction admits of a very convenient arrangement of the machinery. The extreme bow and stern ends of the vessels are high enough inside for a man to stand upright. Because of their special form it is possible to mount in the Italian boats more powerful motors, larger accumulators, and bigger pumps than are permissible upon the same displacement in submarine vessels having the usual spindle form of main hull. Even though the Italian boats have not the circular cross-section recognized as being that best capable of resisting high compression, still they are able to withstand safely a submergence of 150 feet if such be required.

(9) *Sighting Instrument.*—The Italian boats are equipped with two sighting instruments for submerged navigation. These instruments are of the Russo-Laurenti type, and possess a field of vision of 50°. The portion extending above the surface has a diameter of about 3.5 inches. The instrument is so designed that the eye piece gives a large image, and does not require the observer to keep his eye constantly fixed thereon. In this way eye fatigue is avoided, and continual observation can be had without any of the tiring stress common to the general run of these instruments. The instruments are so arranged that they give normal vision and magnified vision, the latter being designed to enable the observer to distinguish distant objects and to read correctly visual signals.—*The Engineer.*

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Satsuma	19,200	Yokosuka.	Launched Nov. 15, 1906.
Aki	19,800	Kure.	" Apr. 15, 1907.
Huki	19,800	Yokosuka.	Building.
Armored Cruisers.			
Ibuki	14,600	Kure.	Launched Nov. 21, 1907.
Kurama	14,600	Yokosuka.	" Oct. 21, 1907.
Protected Cruiser.			
Tone	4,100	Sassebc.	" Oct. 24, 1907.
Scouts.			
Yodo	1,350	Kobe.	Building.
Mogami	1,350	"	"

The Japanese government has announced officially that the loss of the *Mikasa* was due to spontaneous combustion of powder in the magazines. The naval budget for 1908-09 amounts to 80,948,861 yen, of which 34,810,737

yen is for ordinary and 46,138,124 yen for extraordinary expenses.—*Le Yacht.*

The turbine machinery for the *Ibuki* was shipped from the United States (Curtis turbines made by the Fore River Co.) early in May, and that for the *Aki* will be shipped in August or September. The *Ibuki* resembles the *Kurama* except that the latter has reciprocating engines. Their battery is said to consist of four 12-inch guns in two axial turrets, eight 8-inch guns in eight single gun turrets, and fourteen 4.7-inch guns. The water line protection consists of a belt of 7-inch maximum thickness extending over about half the length.

LOSS OF A JAPANESE CRUISER.—The Japanese training cruiser *Matsushima* was sunk off the Pescadores on April 30. Admiral Yoshimatsu, in command of the training squadron, in his report states that an explosion occurred in the vessel's magazine while she was anchored off Makang. The vessel sank immediately until only the bridge was visible. The boats of other cruisers saved 141 of the crew, including some officers, but the majority of the officers, including the captain, had not been rescued at the time of the despatch of the report. There were 58 cadets on board, out of a complement of 300.—*Army and Navy Gazette.*

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I.	16,900	St. Petersburg.	Launched Sept., 7, 1907.
Andrei Pervozvannui	16,900	"	" Oct. 20, 1905.
Evstafi	12,500	Nicolaiev.	" Oct. 1906.
Ivan Zlatoust	12,500	Sevastopol.	" May 13, 1906.
Armored Cruisers.			
Bayan	7,800	St. Petersburg.	Launched Aug. 15, 1907.
Pallada	7,800	"	" Nov. 10, 1906.
Protected Cruiser.			
Outchakoff	6,750	Sevastopol.	Building.

THE NAVAL ESTIMATES.—The estimates of the Ministry of Marine for the present year, as originally proposed, were calculated on a modest scale, as the sum assigned for construction during a period of four years is no more than 125 million roubles—1881 million marks (£17,722,220), or some 31 millions (£4,430,50) annually. It is proposed to build four battleships, each of 21,000 tons displacement, with more powerful armament and turbine propelling power, in place of the present engines. These alone will entail an expenditure of no less than 84 millions (£11,900,000). Out of the balance it is proposed to construct five destroyers of 700 tons, similar to those which have been built by voluntary contributions, but of considerably greater speed; and also to construct three submarines. A balance of seven millions (£991,666) remaining from last year's estimates is allotted to the completion of the battleships *Andrei Pervozvannui, Imperator Pavel I.*, and the armored cruisers *Rurik, Bayan*, and *Admiral Makaroff*. The turbines for the projected battleships will be supplied by the Baltic works, and the whole equipment furnished by Russian works or yards.

The following details in regard to the projected new ships have been laid before the Committee of the Duma on the Estimates:

The four new battleships are to have a displacement of 21,000 tons and a speed of 21.2 knots; the armament to consist of ten 12-inch guns and fourteen 4.7-inch quick-firing guns, with a proportion of lighter guns not yet fixed. The time for construction is to be four years for the first ship, and for the other three, three years. The five destroyers are to have a displacement of 700 tons, to carry an armament of one 4.7-inch and five 13-pounder quick-firing guns, and to have a speed of 26 knots. The three submarines are to have a displacement of 450 tons.

It has since been reported that at the request of the committee the government have agreed to the postponement of the construction of the four battleships until next year.

The formerly Russian battleship *Orel* has been reconstructed at a cost of 7,500,000 francs. The freeboard has been reduced by the height of one deck and the entire superstructure has been removed. All the guns, excepting the forward pair of 12-inch, are on the same level, that of the main deck. The twelve 6-inch guns of the old battery have been replaced by six 8-inch guns. The *Orel's* new name is the *Izwami*. Two other ships, formerly the *Peresviet* and *Pobieda*, now the *Sazami* and *Suivo*, are to be refitted with four 12-inch each, instead of four 10-inch guns, the increase of weight being made possible by the removal of their 6-inch guns and military masts.

LAUNCHES.—On the 7th of September last the launch of the first-class battleship *Imperator Pavel I* took place at the Baltic works, in the presence of the Minister of Marine. Her principal dimensions are as follows: Length between perpendiculars, 438 feet; extreme length with ram, 460 feet 6 inches; extreme beam with sheathing, 80 feet; mean draft, 27 feet; displacement, 16,630 tons. The two four-cylindered triple-expansion engines are of a type specially designed by the Baltic works, and are to develop 17,600 I. H. P., giving a speed of 18 knots. The boilers (25 in number) are of the Belleville type, also built at the works, and are placed in three compartments, forming five stockeholds. The normal coal supply will be 1500 tons, but 3000 tons can be carried on emergency, and there will also be storage for oil fuel. The first plate was laid down in October, 1904. Her armament will consist of four 40-caliber 12-inch guns, twelve 45-caliber 8-inch guns, twenty 12-pounder quick-firing guns, with twenty 3-pounder and machine guns, and five submerged torpedo tubes. Protection will be afforded by a complete water-line belt 11 inches thick, tapering to 6 inches with an upper belt reaching to the main deck 10 inches thick, tapering to 3 inches. The armor for barbette bases and turrets will be 12 inches for the 12-inch guns, and 7 inches to 6 inches for the 8-inch guns; that for the conning-tower will be 8 inches, and the armored deck 2 inches.

The first-class armored cruiser *Bayan* was successfully launched from the Galernii Island Yard at St. Petersburg on August 15 last. Her principal dimensions are as follows: Extreme length with ram, 450 feet; beam, 57 feet 6 inches; draft, 23 feet, 3.8 inches; with a displacement of 7800 tons. The engines are to develop 16,500 I. H. P., to give a speed of 21 knots, steam being supplied by 26 Belleville boilers, engines and boilers being constructed by the Franco-Russian works. The normal coal stowage will be 750 tons, but 1100 tons can be carried if required.

The armament consists of two 8-inch, eight 6-inch, twenty 12-pounder and four 6-pounder guns, with two submerged torpedo-tubes. The 8-inch guns are mounted, each in one of two revolving barbettes; the 6-inch guns in separate casemates; and the smaller ones, eight in an armored central battery on the gun deck and sixteen on the upper deck. Protection is afforded by a complete water-line belt of Krupp steel 7 inches thick, tapering to 4 inches at bow and stern, with an upper belt 3.5 inches thick, tapering to 2.7 inches. The barbettes are protected by 5.8-inch armor, and the casemates with 3-inch; the conning-tower with 5.4-inch, and ammunition tubes with 3-inch, while the armored deck is 2 inches thick.

COMMISSIONING OF NEW SHIPS.—The *Rurik* and *Admiral Makaroff* will be added to the Baltic fleet this year, and the *Ivan Zlatoust* to the Black Sea fleet. During the past year eight destroyers of 350 tons displacement, built by the Neva works on the model of the *Buiny* have been added to the Baltic fleet.—*United Service Institution.*

UNITED STATES.

VESSELS BUILDING.

No.	Name.	Speed. Knots.	Where Building.	% of Completion May 1, 1908.
	Battleships.			
26	South Carolina	18.5	Wm. Cramp & Sons.	45.9
27	Michigan	18.5	New York Shipbl'g Co.	50.7
28	Delaware	21	Newport News.	22.8
29	North Dakota	21	Fore River.	31.6
	Armored Cruisers.			
13	Montana	22	Newport News.	98.0
	Scout Cruisers.			
	Salem		Fore River Shipb'g Co.	96.4

THE BATTLESHIPS DELAWARE AND NORTH DAKOTA.—When Great Britain brought out the *Dreadnought*, each of the other leading naval powers set about designing a *Dreadnought* of its own. France laid down the *Danton*, an 18,400-ton ship, carrying four 12 and twelve 9.4-inch guns, Germany produced the 17,710-ton *Ersatz Sachsen*, which is generally credited with carrying sixteen 11-inch guns. Japan laid down the *Satsuma*, an 18,800-ton ship mounting four 12's and twelve 10's. The answer of the United States was the *Delaware*, of 20,000 tons displacement, carrying ten 12-inch guns as its main armament.

Although we have spoken of the *Delaware* and *North Dakota* as being the first of our *Dreadnoughts*, it is quite a question whether the *South Carolina* and *Michigan* are not entitled to be called the first of this class. They fall below it chiefly in their displacement, which is only 16,000 tons; but they carry a main armament of eight 12-inch guns and therefore are entitled to rank in the all-big-gun class. These ships, moreover, have a main armor belt which is 16 feet wide and varies from 8 to 11 inches in thickness. The speed is 18½ knots, and the maximum coal capacity 2200 tons. Taken altogether, then, they would seem to be well qualified to "lie in the line" against any of the modern *Dreadnoughts* which may oppose them.

The *Delaware* and *North Dakota* represent a great advance, on practically every point of comparison, over any existing ships of the United States navy. The most notable increase has been in the displacement, which on the normal draft will be 20,000 tons, or 4000 tons greater than that of the next largest of our battleships. They will be 510 feet in length between perpendiculars and 518 feet 9 inches in length over all. They are 85 feet 2½ inches in breadth on the load water line, and at their normal displacement of 20,000 tons, when they will be carrying two-thirds of their full supply of ammunition and stores and about 1000 tons of coal, they will draw 26 feet 11 inches of water. At full load displacement with full supply of ammunition and stores and 2500 tons of coal in the bunkers, they will displace 22,060 tons.

The *Delaware* is being built by the Newport News Shipbuilding Company, and the *North Dakota* by the Fore River Shipbuilding Company. The progress on the two ships is shown month by month in the accompanying table:

Month.	Delaware.	North Dakota.
October 31, 1907	2.33	4.23
November 30, 1907	5.08	7.84
December 31, 1907	7.05	12.70
January 31, 1908	9.20	17.50
February 29, 1908	12.77	21.40
March 31, 1908	18.1	25.7
April 30, 1908	22.8	31.6

The great length of the *North Dakota* and the fineness of her model, as rendered necessary by the high speed of 21 knots, which she is expected to attain, necessitated an increase in the height of the freeboard forward to enable her to steam comfortably into head seas. Consequently, a forecastle

deck has been provided, extending from the stem to abreast of the forward smokestack. This deck has a freeboard at the stem of 25 feet 9 inches and abreast the forward turrets of 25 feet 1 inch. From the forward smokestack the main deck runs flush to the stern, with an average freeboard of about 18 feet. The freeboard amidships, as designed, is 17 feet 10 inches on a draft of 26 feet 11 inches. The decks of the ship have been kept as free as possible of all incumbrances with a view to enabling them to present a glacis above which the 12-inch guns may fire without obstruction. Also, the top hamper in the way of boat cranes, flying bridges, etc., has been reduced to the lowest possible limit, and the masting and standing gear have been also simplified.

The battery of ten 12-inch 45-caliber guns is disposed as follows: Forward on the forecastle deck are two two-gun turrets, arranged one behind the other on the axis of the ship, and as close to each other as is consistent with sufficient clearance for turning. No. 1 turret carries its guns at a height of 31 feet 5 inches above the normal water line. The guns of No. 2 turret which fire above the roof of No. 1 have an elevation of 39 feet 5 inches above normal water line. These guns have a fine command and are carried at a height which will insure their being fought in any reasonable weather. Immediately back of turret No. 2 is a conning-tower protected by 12 inches of nickel steel, with its slots showing just above the roof of the turret in front of it. Above the conning-tower is a small navigating platform, and above this, carried on an open lattice-work tower, is a lofty "fire control" platform, on which will be stationed the officers who will operate the range finders, note the splash of the shells, and telephone the range and other directions as to fire to the different gun stations throughout the ship. The *North Dakota* has two smokestacks of moderate height, the bases of which will be armored sufficiently to keep out the lighter rapid-fire shells. Between the smokestacks and abreast of each other, one on each beam, will be the two hollow steel masts, each of which will serve as the mast for a boat derrick for handling the few ship's boats which will be carried. Two of these boats will be on the main deck, and there will be two nests of four each abreast of the forward smokestack on the forecastle deck. The two masts will be connected by a lofty flying bridge, below which will be small platforms containing independent compasses. Immediately abaft of the after smokestack will be a second lofty fire-control platform, carried upon an open latticework tower, similar to the one above the conning-tower. Immediately abaft of this will be turret No. 3, whose guns will be carried at an elevation of 32 feet 2 inches above the water line. About 50 feet further aft on the main deck will be turret No. 4, and immediately abaft of this, separated only by sufficient room for clearance, will be turret No. 5. The guns in turrets 4 and 5 will be carried at an elevation of 24 feet 2 inches above the normal water line. All 12-inch guns can fire on each broadside, and four 12-inch guns can be fired dead ahead and four dead astern.

For repelling torpedo-boat attack the *North Dakota* will carry fourteen 5-inch 50-caliber guns, all of which will be mounted upon the gun deck, with their axes at an elevation of 14 feet 4 inches above normal water line. Ten of these guns will be carried in a central citadel amidships, protected by a continuous wall of 5-inch armor which will be carried entirely around the citadel, the bulkhead armor at the ends serving to protect the guns against a raking fire. Between each of the guns a transverse wall of armor will extend inwardly to a junction with a rear wall running parallel with the axis of the ship. Each gun will thus be emplaced in a completely inclosed casemate; so that the destruction wrought by a shell will be confined to the particular casemate in which it may burst. The other four 5-inch guns will be mounted in separate casemates, two forward and two aft. These last four casemates will be sponsoned out sufficiently to enable the guns to fire slightly across the line of the axis of the ship, thus cutting out any dead angles and enabling the 5-inch battery to sweep the whole arc of the circle.

Particular attention has been paid in these ships to the protection of buoyancy and the preservation of the longitudinal strength of the ship. In the first place, the framing, which is deep and heavy, is carried up to the level of the protective deck, which is not sloped down to the bottom of the armored deck, as in previous ships, but is carried out to a junction with the top of the armor belt at a height of over 3 feet above the normal water line. With a view to increasing the girder strength of the ship (a necessary precaution in view of the great length of the ship and the enormous concentrated weight of the turrets) the protective deck is made unusually heavy, and four complete longitudinal bulkheads are provided. Immediately back of the armor belt is a "wiring" passage in which the various electrical cables will be placed. Far below the water line and in the second longitudinal compartment between the two interior bulkheads, will be built an ammunition passage, provided with rapidly running travelers for the transfer of ammunition. The whole of the space amidships between these two bulkheads and the side of the ship will be filled with coal except where it is otherwise occupied by the two passageways above referred to. The space between the protective deck and the gun deck will also be filled with coal; and it will be seen at a glance that this arrangement, coupled with the 15-foot armor belt from 8 to 11 inches in thickness, will afford protection of an unusually satisfactory character to the stability of the ship against gun and torpedo attack.

In addition to the armament as above described, the *North Dakota* will carry four 3-pounder and four 1-pounder semi-automatic guns, two 3-inch field guns for use with landing parties and two .30 caliber machine guns. She will also be provided with two submerged tubes for firing the new 21-inch torpedo.

The water line and side of the ship will be protected by a wall of armor 22 feet 8 inches wide, reaching from about 5 feet below the water to the main deck. The lower belt will be from 9 to 11 inches in thickness; the upper belt from 10 to 8 inches, and the citadel armor 5 inches in thickness. Back of the thicker armor will be about 20 feet of coal. The 12-inch guns will be protected by 8 to 12-inch armor on the barbettes and the turrets.

The motive power of the *Delaware* will consist of water-tube boilers and triple-expansion engines of 25,000 horsepower. The *North Dakota* will be driven by two Curtis turbines of the same horsepower, and the estimated speed of the ships is 21 knots. The contract price of the hull and machinery of the *Delaware* is $3,987,000 and the contract date of her completion is August 6, 1910. The contract price of the *North Dakota* is $4,377,000, and she is to be completed June 21, 1910.—*Scientific American.*

ORDNANCE AND GUNNERY, TORPEDOES.

There has been so much interest in the proposed test of high explosives on the *Florida* that Rear-Admiral Mason, chief of the Bureau of Ordnance, has given out the following statement which gives with distinct frankness as much as can possibly be said of a series of experiments that deal with a subject about which ordnance officers in every army and navy in the world observe strict secrecy:

"1. The object of these experiments is to obtain complete and accurate information, in a practical way, concerning the actual effect, upon the internal fittings and other portions of a ship's structure, of gun and torpedo attack upon present conditions.

"2. The *Florida*, a comparatively modern ship, was selected because her internal subdivision permits a very close approximation to the framing and interior subdivision of the latest battleships.

"3. The tests will be in two series, a gun-fire test and a torpedo test, under the joint cognizance of the Bureaus of Construction and Repair and Ordnance.

"4. For the former, the *Arkansas*, a sister ship, will fire a 12-inch pro-

jectile loaded with high explosives, to strike the *Florida's* turret with an energy little short of penetration, in such a way that most of the fragments will fly across the bows clear of the ship. It is not intended to penetrate the turret armor and the test is in no respect a contest of gun against armor or armor against gun, the effect of the shock only being desired. The shock, under the conditions above noted, will be approximately the greatest that could be experienced in battle. This will probably be the only shot fired against armor, but another glancing blow against one side of the turret may possibly be decided on.

"5. After the inspection of the results of this test, several shots from the 4-inch and 12-inch guns of the *Arkansas* will probably be aimed at the experimental military mast that has been erected on the stern of the *Florida.*

"6. It is not desired to make known the details of the torpedo test, for obvious reasons; but it will suffice to say that one or two torpedoes may be exploded against the bottom of the *Florida* under such conditions that salvage operations, if necessary, will not be difficult. It is not intended to destroy the vessel or do more than local injury, and she will be restored to her former condition of usefulness as soon as practicable after the necessary experimental data has been obtained.

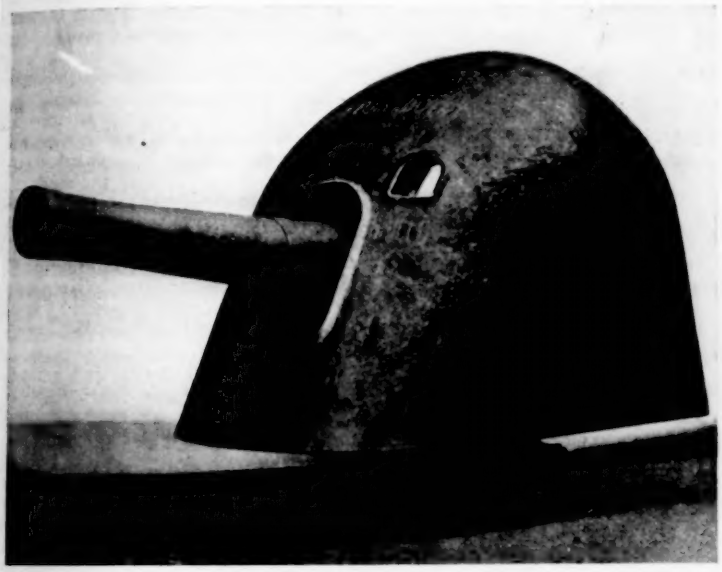
"7. These tests will probably occur about the middle of May, and, for obvious reasons, it is not desired that any but officials directly concerned should be present. The general results of the test, as far as may be permissible or proper, will be given to the press as soon as practicable after the conclusion of the tests and the submission of all reports in relation thereto."

One of the turrets of the *Iowa* was subjected to a somewhat similar test, but at the time high explosive such as now used was not in vogue and the test was not on the ship or on water. Tests innumerable have been made at the Indian Head proving ground of armor plate and steel construction so that that phase of the matter does not enter into the work to be done with the *Florida.* The idea now is to fire a 12-inch shell fired with 60 pounds of explosive D at a turret prepared to be in as nearly the conditions of battle as can be attained. There will be two 12-inch guns in the *Florida's* turret, one of them a sawed-off gun, the muzzle of which had burst, making it necessary to send the gun to the shop to be worked over. If this gun receives a dent or so it will not matter, and there is little likelihood of its being smashed so as to be rendered valueless. The other gun will be protected by an armor plate partition. There will be no effort to secure a penetrating shot. The effect of every shot will be photographed and competently noted by a board of expert officers. They will tell whether the turret is jarred off its roller path, whether the gear is disturbed, the electrical apparatus in any way disabled, the fire control injured, the ammunition hoist put out of order, whether the gun sights are hurt, and determine a hundred and one other things that pertain to the fighting value of the turret. The torpedo test will be directed at one particular part of the ship and in a manner to test the idea that filling the water compartments affords protection, as has been urged of late.

The tests are made with the understanding that the *Florida* shall not be sunk or destroyed and shall be put back in good shape after the experiments. The shots will probably be made at close range and with nicely calculated charges which will secure a low muzzle velocity. The tests will be made in the presence of a large number of naval officers, and several army officers have been invited to be present. No newspaper men will be allowed to witness the firing. It is distinctly announced that there will be no risk of human life by having anyone on board the *Florida,* and as the only point to be made by having animals on board would be to see what effect severe shock would have on them, and they would have no value as eyewitnesses, there is no likelihood that the *Florida* will have a crew or passengers of any kind.—*Army and Navy Journal.*

The Admiralty having given attention to the question of ear protection during heavy gun-firing, it has been decided to use Plasticene, with the addition of cotton-wool, but the form of ear protection to be used is to be left to the individual choice of officers and men. Plasticene may be supplied to ships and gunnery schools if specially demanded. The addition of 50 to 60 grains of cotton-wool has been recommended to ensure perfect safety. The cost of the material is very small, and its use is desirable in many cases.—*United Service Gazette.*

CAST STEEL GUN SHIELDS.—The illustration shows one of Hadfield's "Era" cast steel shields for a 6-inch gun, such as the British government is now using in land fortifications. One of their great advantages is the



HADFIELD'S "ERA" CAST STEEL GUN SHIELD.
Weight 9¾ tons for 6-inch gun.

distribution of metal; in front the thickness is about 9 inches, tapering at the sides to only 2 inches, thus giving the greatest protection with the least weight, in a manner not possible with rolled or forged structures.

Recently one of these shields, selected at random by the government inspector, was attacked as follows. Four rounds of 4.7-inch armor-piercing shell were fired at about 1850 f. s.; these made but little impression on the shield. A 6-inch ordinary bursting or common shell, filled and fused, was next fired at about 2020 f. s., this made even less impression on the shield. Then one of the latest type of 6-inch capped strong shot was fired at 2060 f. s., the striking velocity and energy being sufficient to perforate about 8½ inches of K. C. armor. Notwithstanding this severe test there was only a scoop made on the shield about 3½ inches in depth. All these rounds were taken at one side of the shield, so it was severely punished in a comparatively small area.

There is no doubt this "Era" steel opens up an important future in connection with shields not only for land service, but also for warship con-

struction, to which it has already been applied on a large scale for ammunition and communication tubes, director towers, etc. Gun houses will also very probably eventually be made of this material, as there will be no key joints, and owing to the contour and design, which can be given in a way not possible with rolled plates, much better protection will be obtained.

THE PROGRESS OF THE TORPEDO.—As vital national issues are dependent upon munitions of war, it is universally agreed that their efficiency should not in the slightest degree be weakened by unsatisfactory details, least of all on the score of expense. This view further requires that every unit constituting the complete implement of war must be of the most approved form. The fastest cruiser with anything short of the most powerful guns possible within the limits of weight permitted by general considerations of design would not be satisfactory. A battleship well armored, with the best of propelling machinery, and with the most reliable of guns, would be a source of weakness to a fleet if her gun-mountings were unsound. Such points are often forgotten in elaborate statistical comparisons of the fleets of different powers, and yet they are almost as important to fighting efficiency as the skill and experience of the *personnel*. In the measuring of relative efficiency, the only substitutes for the test of actual warfare are the maneuvers, which are more extensive in the British than in other services. A comparative study of contemporaneous progress in the mechanical sciences associated with peace and war industries further enables one to appraise with moderate accuracy the official attitude towards appliances which give reliable promise of increasing the efficiency of weapons of warfare. The evidences afforded by these two standards of measuring progress are reassuring so far as the British Navy is concerned. In recent years the tendency has been distinctly progressive. The existing exceptions are, as a consequence, the more surprising, and call for the keener criticism.

One of the most important instances where there has not been a ready response to successful unofficial effort towards improving war munitions is in the case of the torpedo. Recently we have placed on record the splendid results achieved by torpedo-boat destroyers, which realized speeds of from 33 to 35 knots, and now we have in a paper read before the Liverpool Engineering Society by Mr. E. C. Given convincing proof of the success of the submarine or submersible boat. All is thus well with the vessels which are to use the torpedo as a weapon of war. But when measuring the significance of the efficiency of these surface and submersible torpedo-firing boats, it is imperative that the efficiency of the torpedo itself should be considered. If the most effective weapon is not used, the best cannot be got from the boats. It is idle to increase the expenditure of a surface boat from £70,000 to £120,000, to get 34 knots instead of 30 knots, and at the same time accept a torpedo which has a speed of only 24 knots at 3000 yards range, when there is available a weapon of 32 knots speed at the same range, and particularly when other governments are adopting the new instrument. Modern naval tactics favor long range, and the torpedo which has a speed of 28 knots at 4000 yards range will be immensely superior to one of from 18 to 20 knots at such range. The advantage is correspondingly greater at shorter range. Indeed, the formerly approved practice of fitting bow tubes to warships had to be discontinued because the speed of the torpedo-boat, and even the cruiser, was approximating so nearly to that of the torpedo itself. When, in 1886, the 125-foot torpedo-boats could overrun the torpedo then available, the Mark IV Fiume torpedo was introduced, and gave the necessary improvement in speed, but only for the short range of 600 yards. Some years ago the same difficulty of relative speed again arose, and the bow tube was abolished. The best torpedo in the navy at 1000 yards range has a speed of only 35 knots, and at 1500 yards range 30 knots. Destroyers of 33 to 35 knots would thus overtake the torpedo they had fired ahead in less than two minutes. Thus

with low-speed torpedoes any attempt to fire ahead would be attended by serious danger.

Now torpedoes are available which have a speed of 43 knots at 1000 yards, and of 40 knots at 1500 yards; so that, if these were adopted, we could return with greater safety to the bow tube, which has great advantages. A destroyer approaching the enemy bow-on, alike in open sea or restricted waters, presents a much smaller target, can fire the torpedo more easily, and, reversing engines, can escape backwards more quickly. Thus it used to be a condition of the contract, in some foreign navies—if not also in the British service—that a given astern speed should be realized on trial. The contingency that the charged point of a torpedo in a bow tube, being above water, was likely to be struck by a projectile, scarcely holds, since above-water tubes are fitted elsewhere in the latest ships.

The splendid results achieved by the latest torpedoes, giving an increase in speed of about 10 nautical miles per hour at all ranges, has been achieved by the application of air-heaters. It is now some years since the world was startled with rumors from America of the extraordinary results achieved by the Bliss-Leavitt apparatus for heating the air of torpedoes, and from that time the firm of Whitehead & Co. have devoted considerable attention to the investigation of this subject. Having taken over the patens of Sir W. G. Armstrong, Whitworth & Co., in connection with heating devices, they have succeeded in producing a heater considerably more efficient than was accredited by rumor to the Bliss-Leavitt. The heater consists of a small steel chamber between the air-vessel and the engine of the torpedo, in which a certain amount of liquid fuel is burnt in conjunction with the air passing to the engine, resulting in a gain in power of 100 per cent as compared with the same engine and air-vessel when run cold. It is, however, in the extreme simplicity and safety of the Whitehead hot-air torpedo that its chief claim to superiority lies. The whole apparatus takes up only about 3 inches of the torpedo's length, and weighs about 12 pounds. Details of construction are, of course, only known to the makers; but they are such that no difficulty is experienced in handling the torpedo by any man acquainted with this weapon. In order to show clearly the advantages which have been obtained by thus heating the air, the following table gives the speeds at various ranges of the latest Whitehead torpedo when run cold and hot; and, in this connection, it may not be out of place to remark that the latest Woolwich torpedo does not equal the Whitehead as regards speed at any range:

TABLE SHOWING SPEEDS OBTAINED BY THE LATEST WHITEHEAD 18-INCH TORPEDO.

	With cold air.	With hot air.
At 1000 yards	35 knots	43 knots
" 1500 "	30 "	40 "
" 2000 "	28¼ "	38 "
" 3000 "	23 to 24 "	32 "
" 4000 "	18 " 20 "	28 "

As we have already said, foreign countries are showing keen interest, and are acquiring torpedoes fitted with this heater; and at the present time the United States government are obtaining these weapons from the Whitehead Company at Weymouth, whilst the Whitehead Works at Fiume are extremely busy with orders from European governments and some States of South America. At the present time, we understand, the British Admiralty has, so far, not followed the example of foreign countries. It is impossible for the Admiralty to long delay equipping the fleet with the torpedoes so markedly superior to those of the government's own construction, in view of the activity displayed by other countries in providing themselves with complete equipments of this weapon.

The importance of having the very fastest torpedoes available is great, not only on the grounds that the torpedo should, at least, be faster than the torpedo craft, but also because the errors which are of necessity present in practice with these weapons are very much reduced as the speed increases; and the possibility becomes more remote of the enemy avoiding a torpedo when its track discloses its progress. As the result of a large number of runs with the Whitehead hot-air torpedo at Portland, it was clearly shown that for steadiness of running, both for speed and direction, the hot-air torpedo is superior to the same torpedo when running cold; this superiority being more marked in cold weather, as after the water temperature has dropped to about 40° Fahr. it is impossible to run the ordinary cold-air torpedo. Thus every consideration establishes the great importance of the adoption of the new weapon, and until this is done the best cannot possibly be realized from the improvements achieved with our torpedo craft.

The unceasing work done by the naval architect and marine engineer to improve the craft, while the torpedo authorities seem to be standing still, can be easily demonstrated. One instance must suffice here. Our new destroyers, of 790 tons displacement, steam 34 knots for 11.36 tons of oil fuel per hour, and continue thus on official trial for six hours, while ten years ago the boats of limited capacity and radius of action, because of only 360 tons displacement, required 8 tons per hour for 30 knots, and even then could only keep this up for three or four hours. The engine power has had to be trebled, and yet the weight of fuel used is only increased about 40 per cent.

The paper read by Mr. Given indicates that corresponding progress is being made with submersible boats. He deals with the vessels built for all Powers. In the British boats, which have increased in displacement from 120 to 500 tons, the surface speed has been augmented to the extent of about 75 per cent—from 8½ to 15 knots—while the submerged speed has increased 30 per cent—from 7 to 9 knots. It will be realized that great difficulties are associated with increase of speed, especially submerged. The power then utilized is electric, and the current must be stored in batteries. Thus, while the oil-engines used for propulsion, according to Mr. Given, weigh about 56 pounds per brake horsepower, the weight of the electric mechanism is 235 pounds per electric horsepower. Strategists are not, however, agreed as to whether high speed, when submerged, is necessary. Mr. Given says: "The surface speed is the strategic speed, enabling the vessel to quickly reach or leave the fighting zone; whereas the submerged or tactical speed is of less importance (except for attacking moving vessels) as when submerged they are unseen; and it is thought that the only means of attacking a submarine is with a spar-torpedo, and this is extremely difficult to carry out, as the submarine can dive or maneuver out of reach if the water be deep enough." With increased length there is a possibility of increased surface speed, but the fine ends of the ordinary surface-boat cannot be approximated. The proportion of length to beam in submersibles has undergone a great change. The earlier British boats had a length of about five times the beam, and the later ones of about ten times the beam. The increased length tells against the diving and maneuvering, especially in shallow and confined waters, so that the problem of speed is one of great difficulty, particularly if the success hitherto achieved—notably with British vessels—in connection with maneuvering and quick diving is to be continued. No doubt the speeds will increase, and we shall at an early period have submarine-boats corresponding in speed to the battleships, with equal radius of action and good sea-going qualities. That being so, there is the greater need for an active policy at the Admiralty in connection with torpedoes, without which the submarine or surface torpedo-boats are practically useless. We have no doubt that parliamentary pressure would result in a more courageous policy in this matter. We cannot believe that the question is one of economy. No doubt the replacing of the existing

torpedoes of deficient range by the latest instruments would involve a considerable sum, but when it is considered that the efficiency of vessels, costing millions of pounds, is greatly lessened by the absence of the best torpedo, only "economists at all costs" would oppose any proposal for adopting the new torpedo.—*Engineering.*

MARINE TURBINES AND GAS ENGINES.

LIQUID FUEL.

CURTIS TURBINES FOR JAPANESE WARSHIPS.—The Fore River Co., of Quincy, Mass., has just completed and shipped to Japan, by the British steamer *Bisley*, the Curtis turbines for the armored cruiser *Ibuki*. Turbines of the same type for the battleship *Aki* are to be shipped in August. The following description of the *Ibuki's* turbine machinery is taken from the *Scientific American:*

The motive power of the *Ibuki* consists of two turbines, which are designed to develop a normal horsepower of 24,000, sufficient to drive the *Ibuki* at 22 knots speed. They are intended, however, to develop a maximum overload horsepower of 27,000, which should suffice to give a speed of nearly 23 knots. The rotor is 144 inches in diameter. The casing has an outside diameter of 14 feet, and a length over all of 17 feet. The weight of the two turbines together is 360 tons.

Each turbine consists of a cast-iron cylindrical casing divided by dished diaphragms into a series of separate compartments. In each compartment or "stage" there is a separate wheel, which carries on its periphery three rows of moving buckets (for reasons later described the first wheel has four rows). The wheels are all mounted on a hollow steel shaft carried by two bearings. Where the shaft passes through the diaphragms, they are provided with bronze bushings having a small clearance, thus preventing appreciable steam leakage from one stage to the other. Where the shaft passes out through the ends of the casing, it is provided with carbon stuffing boxes, which prevent steam leaking out at the ahead end, or air leaking in at the back end where a vacuum exists.

The stuffing boxes are supplied with steam in the space between the carbon packing, to prevent air leaking in and lowering the vacuum. They are also drained to the fourth-stage shell.

Cast-steel steam chests for ahead and astern running are attached to the front and back casing heads as shown, and are flanged for the main steam pipes. The nozzles for each stage are bolted to the diaphragms the diaphragms having steam-port openings cast in them to allow the steam to pass through to the nozzles.

Maneuvering is accomplished by means of two lever-operated balanced throttle valves, each taking steam from the main steam pipe, and one delivering to the ahead steam chest and the other to the astern steam chest. There are seven ahead wheels and two reverse wheels. The reverse wheels are mounted in the after end of the casing, and under ordinary ahead running they are in a vacuum, and therefore do not waste power by steam friction. They are similar to the ahead wheels, except that the blades are reversed. To reverse when going ahead, the ahead throttle valve is shut and the reverse throttle valve opened, which is easily and quickly accomplished by the operating levers of the two throttle valves.

Drain pipes are provided, connecting each stage with the next, so the condensed steam in any stage will pass to the next one of lower pressure, and there give up a part of its heat to do useful work. The exhaust chamber drains to the condenser, and the discharge is assisted by a small steam ejector. A regular marine thrust bearing is attached to the forward end of the turbine shaft. In addition to taking the propeller thrust, this bearing also maintains the proper axial position of the rotor, so that the axial clearance of the blades is correct. This clearance is one-tenth of an inch on the first wheel, and increases to one-quarter of an inch on the seventh

wheel. The thrust is put at the forward end, so that any unequal expansion of the shaft and casing will be allowed for at the aft end where the clearance is largest. This axial clearance is very ample to allow for all unequal heat expansion that may occur, and any mechanical irregularities, and leave sufficient leeway for adjustment.

To allow for the increased volume of the steam as it expands in passing from stage to stage at lowering pressures, the lengths of the blades are increased, and also the arc of the nozzles is increased, thus giving greater area of passage in each succeeding stage. Also, in any one stage, the blade lengths are increased in each succeeding row, because the velocity falls as the steam passes from row to row, although it is at practically constant pressure throughout the stage.

In order to keep the pressure in the shell as low as possible, the pressure distribution is arranged so that one-fourth of the available energy of the steam is expended in the first stage, and one-eighth in each of the other stages. This requires the first-stage nozzle to be of the expanding type, but all the other nozzles are of the parallel-flow type. Also, the first-stage wheel is provided with four rows of buckets instead of three, as on the other wheels, since the greater energy drop produces greater velocity of the steam jet from the nozzles, which requires more rows of buckets to properly absorb the energy at the bucket speed used. This arrangement makes all the ahead wheels except the first operate under eight-stage conditions. The principal advantages of the Curtis design of marine steam turbine are as follows:

Small number of blades.
Large clearance around blades.
Strong mechanical construction of blading.
Economy at reduced speed, without cruising turbines.
Interior of shell not subjected to full steam pressure.
Low revolutions for given horsepower.
Absence of dummy pistons and packing.

The small number, large clearance, and strong construction of the blades make blade stripping practically impossible, and no case has occurred.

By the use of valves on the nozzle openings of the diaphragms, the proper steam pressure distribution can be maintained at reduced steam flow, thus keeping up the economy at low speed of vessel, except, of course, for the unavoidable loss due to lower revolutions and dispensing with cruising turbines.

Full steam pressure comes on the steam chest only, which is a comparatively small steel casting. The greatest pressure in the turbine shell is less than one-third the working steam pressure. This permits high steam pressure to be used, and large turbine diameter in comparison to the power. It also reduces expansion difficulties.

The comparatively low revolutions permissible for a given power without sacrifice of economy, or excessive weight, allows the twin-screw arrangement to be used instead of three or four screws. Also, other conditions being the same, lower revolutions will give a higher efficiency of the propeller. Low revolutions also permit the use of turbines in comparatively (for turbine vessels) low-speed vessels.

Absence of dummy pistons and their packing eliminates the leakage of high-pressure steam and makes the economy independent of any adjustments, so that the initial economy will be maintained continuously and will not be affected by any wear.

SHIP PROPULSION BY GAS.—Some particulars are now available regarding the speed trials of the ex-gunboat *Rattler*, which has been fitted with a gas engine and suction producer in place of the original reciprocating engines and steam boilers. This obsolete war vessel was lent by the government some considerable time ago to the Clyde division of the Royal Naval Volunteer Reserve, commanded by the Marquis of Graham. The removal of

the old machinery and the erection of the gas engine and accessories was carried out by William Beardmore & Co., Dalmuir. The new machinery consists of a Beardmore Capitaine five-cylinder gas engine, the cylinders being 12 inches diameter, and the stroke 24 inches. Gas from the suction producer is drawn by the cylinders through cleansing and drying chambers, and the gas exhaust is utilized in small boilers for furnishing the steam vapor required in the producer. The horsepower developed by the engine is about 500, and the total weight of the machinery, including gas producer and donkey boiler for working the pumps and auxiliaries, is about 94 tons, as compared with 150 tons in the case of the displaced reciprocating engines and boilers. The starting is effected by a mixture of gas and air pumped up to high pressure, and the speed can be reduced with ease and precision. The astern motion is obtained through a self-contained hydraulic clutch working through an epicyclic train of wheels which reverses the direction of rotation of the shaft and propeller; the engines, of course, continuing to run in the one direction. Stopping is effected by relieving the clutch of hydraulic pressure, and the engine is so governed that it continues to run light with practically no increase of speed. In addition to the advantage of the saving in space occupied and in weight of machinery, there is marked saving in labor, and the coal consumption is reduced by nearly 50 per cent. Some little time ago runs were made by the *Rattler* on eight separate days. For a distance of 45 knots the coal consumed was only 15¼ cwt., and the vessel covered the 30 miles between Brodick and the Tail of the Bank, against a 1½-knot tide, at an average speed of 11.3 knots, the revolutions being 110. During all the trials, and using coal at 15s. 6d. per ton, the average cost per mile worked out a 3.23d., and the average speed was 10.5 knots. The Marquis of Graham, writing of the trials of this "the first British sea-going vessel ever driven by gas power," expresses the belief that "the further development of gas produced plant will give this country the greatest naval economy it has ever had."—*The Engineer.*

OIL FUEL IN THE BRITISH NAVY.—As a result of their experiments, which have been attended with complete success, the British Admiralty have decided to utilize liquid fuel upon an extensive scale in the future. All the new ocean type of torpedo-boat destroyers are designed to burn liquid fuel exclusively, while similarly all the larger warships are to use oil for supplementary purposes more extensively than they have hitherto done. In order to insure an adequate supply of oil independently of the ordinary sources and the fluctuations in the market price of the commodity, the government has secured the extensive oil fields of Nigeria, so that ample supplies of oil will be available in times of peace and war. For the storage of the liquid at the dockyard at Portsmouth huge tanks are to be erected, capable of storing 20,000 tons. The tanks will be surrounded on all sides by earthworks for protective purposes, and will moreover be built in independent sections. From these tanks supply pipes are to be laid down to the jetties alongside which the warships lie during refitting, and thus the fuel will be pumped direct from the tanks into the vessels' double bottoms and bunkers. The naval authorities as a result of their investigations have evolved a special type of apparatus for spraying and atomizing the fuel, and have overcome the difficulties of imperfect combustion and smoke, which at first attended the experiments. The advantages resulting from the use of liquid fuel are reduced personnel in the stokehold, the improved facilities available for carrying the fuel in bulk as ballast in the double bottom, where as it is consumed it can be replaced by water, the solution of the difficulty of coaling at sea, the lesser space required for carrying fuel, and the facility with which it can be handled, combined with the ease with which stoking can be carried out, even when traveling at full speed, without exposing the men to fatigue under the most arduous conditions; and lastly the great heat that can be obtained. Some idea of the developments that are in progress in this direction may be gathered from the fact that

the *Dreadnought* has accommodation for carrying 500 tons of oil, while the vessels of the *King Edward* class have their furnaces adapted throughout for burning liquid fuel, and all the largest battleships and cruisers are provided with facilities for carrying it for supplementary purposes. Their oil fuel capacity is to be enlarged as they are successively returned to the dockyard for overhauling.—*Scientific American.*

FUTURE OF LIQUID FUEL.—C. de Thierry, in an article in the *United Service Magazine,* London, says: "Up to 1902 experiments were made with increasing success to demonstrate the value of liquid fuel as a power creator superior to coal, but always with a certain reserve of doubt. Since then, however, its position has become assured. Every problem in connection with its safe storage, complete atomization, and smokeless combustion has been solved, and naval engineers are unanimous in believing that, with time, it will entirely supersede coal in warships. A sign of the coming revolution is the fact that the Admiralty is providing its own tank steamers for the transport of oil direct from the wells so as to escape the middleman in this country. Moreover, it is constructing great storage works at Plymouth, Portsmouth, and Chatham, capable of holding millions of gallons, and is utilizing old battleships as oil depots for the use of the navy on the coast. The scheme is to be further enlarged by forming a chain of stations all along the frontier, a beginning having already been made in the Falkland Islands. It will thus be seen that the Admiralty is not asleep whatever may be the case elsewhere. At this present moment at least one-third of the vessels on the active list are burning liquid fuel, either supplementary to coal or entirely, which latter is true of the *Mosquito* fleet. The *Dreadnought* herself carries 1500 tons, which she used with signal success on her first Atlantic cruise. In combination with turbines, indeed, the new motive power has revolutionized naval ideas on speed, and fresh records are made every week. Hence more and more oil-fired war vessels are being built, the most remarkable of which is the *Swift,* a large destroyer. Under arduous conditions of trial she is to move at a rate of 36 knots an hour, a 'flier' which may be of the utmost service to an admiral, either as a scout or in a torpedo attack. It is in the matter of economic speed that oil is triumphant, and when suddenly turned its effect is almost miraculous, as in the case of the *Duke of Edinburgh* at a critical moment in last year's maneuvers, when, by its means, she made 23 knots against a head sea. In truth, both in 1906 and 1907 we surprised the other maritime Powers, which have not kept up with us in this direction. The *King Edward* battleships, for instance, were able to draw away from their pursuers by using their liquid fuel in addition to coal, a tactical success which was only one of several due to the persistence and secrecy of Admiralty experiments. Here, at least, we have out-distanced our rivals by superior enterprise.

"But speed is not the only advantage gained by firing war vessels with oil. It can be transferred from ship to ship in rough weather, whereas coaling is dangerous except in a calm. Moreover, the fire can be fed automatically, which means a saving in labor, and as there is absolutely no waste, a saving in weight. That is why the use of liquid fuel enables a fleet to remain longer at sea than is possible in present circumstances, and why in battle its range of action is extended, considerations which tell both in strategy and tactics. True, when a ship's bunkers are full of coal it protects her vitals, whereas oil cannot, but it is the only point where the driving power which has had its day scores over the driving power whose day is come. Now, it is very evident that the power which can depend on the latter with such certainty as to dispense with the former will have an enormous advantage over competitors not so happily circumstanced. For this reason the Admiralty is straining every nerve to secure control of future sources of supply under the flag.

"To-day every inch of the empire is being explored where there are

signs of petroleum, and millionaires are backing ventures in Egypt, Australia, and Persia. It is, however, to Nigeria that the Admiralty are looking with most hope. There is no question that, only for the uncertainty of supply within the empire the motive producer in the navy would now be liquid fuel. But as long as we are dependent for it on the foreigner we cannot afford to supersede steam coal, which is one of our main sources of strength. Admiral Melville, engineer-in-chief of the American Navy, admitted in 1902 that the change must come, but saw difficulties in connection with adopting liquid fuel to battleships and cruisers, as well as in connection with transport. The first is being rapidly overcome, and surely the second, is inseparable from supply."—*Nautical Gazette.*

RADIO TELEGRAPHY.

TRANSATLANTIC WIRELESS TELEGRAPHY.—During a recent discourse on wireless telegraphy Marconi gave a brief historical review of the work of his company in establishing communication across the Atlantic ocean. On March 24, 1899, he sent his first message across the English channel. In January, 1901, he established communication between Cornwall and St. Catherine's Point, Isle of Wight, and thus demonstrated clearly that the curvature of the earth did not cut off the waves, as to clear it a tower more than a mile high would have been needed, while the towers used were only 300 feet high. On December 11, 1901, by means of kites sent up from Newfoundland, Marconi succeeded in catching a series of signals sent out from Poldhu, in Cornwall. In February, 1902, Poldhu kept in communication with the steamship *Philadelphia*, sending messages up to a distance of 1551 miles and signals for 2099 miles. These experiments brought out the injurious effects of sunlight on the electric waves. In December, 1902, communication was established between Glace Bay, Nova Scotia, and Poldhu, and in the spring of 1903 the transmission of press messages was begun, but was interrupted by several accidents and was not resumed. In October, 1903, messages were sent from Portsmouth, England, to Gibraltar, a distance of 1000 miles, 500 of which were over land. During the next few years, changes were made in the forms of the ærials, and one having a more or less directional effect was adopted. In May, 1907, a new station at Clifden, Ireland, was erected and equipped with powerful apparatus, and the transmission of press messages was begun on October 17 of that year. Simultaneously with these experiments Marconi devised a new system of continuous trains of waves, which was tried between Poldhu and Glace Bay with success and was adopted at Clifden station. The apparatus consists of a large disc driven at a high speed by a steam turbine or electric motor. The periphery of this runs between two smaller discs of steel about 18 inches in diameter, which turn slowly in a plane at right angles to the first. These two discs are connected in a circuit with two condensers, which are maintained charged at a high potential by a high-tension, direct-current dynamo. At a point of the circuit between the two condensers a branch circuit is carried off which contains a condenser, an oscillating coil and a large revolving disc. When the condensers are charged and the large disc is driven at a high speed, a spark will pass between this disc and one of the smaller ones, and oscillations are set up in this way with a frequency as high as 200,000 per second. It was found that if the disc be rotated slowly, an arc would be formed between this and one of the side discs. It is thought that the cooling effect due to the high speed prevents the arc and causes the discharge to take place merely as sparks. It was found, however, that these oscillations were of too high a frequency to affect the magnetic detector, although a synchronous coherer would work. But better results were obtained by placing a series of knobs on the large revolving disc, which had the effect of causing the sparks to take place at definite intervals, thus producing a succession of undamped, or slightly damped, waves, which set up a musical note distinguishable in a

telephone receiver. One advantage of this is that there is no confusion between these musical signals and noises due to atmospheric electricity.—Abstracted from *Engineering*.

WIRELESS TELEPHONY.—On April 15, Mr. Valdemar Poulsen, assisted by Mr. Nevil Maskelyne, delivered a lecture at the London Institution on "Telephoning without Wires." The importance of producing electric waves in a continuous stream for wireless communication was first explained, and the advantages claimed for the Poulsen system of producing undamped waves were also explained.

Those who have followed the various developments in radio-telegraphy are, no doubt, familiar with Mr. Poulsen's method of producing a continuous stream of electric waves, and are aware how these waves differ from those employed in spark telegraphy. It is to Mr. Duddell that we owe the original discoveries on which the system is based. About eight years ago Mr. Duddell described some extraordinary experiments which he had made with the electric arc. He found that under certain conditions, when a condenser and self-induction were connected in parallel with an electric arc fed with direct current, oscillatory currents were set up in the circuit. The frequency of these currents which surged through the coil and the arc, and into and out of the condenser, was found to depend on the values of the self-induction and the capacity. The vibrating currents produced changes in the temperature of the arc, and, consequently, changes in its pressure, and the beats which were transmitted to the air in this way gave rise to a musical note, the pitch of which could be changed by altering the capacity of the condenser and the value of the self-induction. The frequencies obtained in this way were too low for radio-telegraphy or telephony, a frequency of about 40,000 per second being about the maximum which could be obtained. Mr. Poulsen was the first to solve the problem of the production of relatively intense oscillations of high frequency. One modification introduced by him is to place the arc in an atmosphere of gas instead of air. Hydrogen, or a compound gas containing hydrogen, has been found to be the best. Coal gas is frequently employed, this being used at the lecture at the London Institution. Mr. Poulsen also cools the electrodes with water. The arc is enclosed in a box with the cooling arrangements through which the gas is passed. Another addition introduced by Mr. Poulsen is to provide a strong magnetic field at right angles to the arc. The object of this is to increase the voltage necessary to maintain a given length of arc. As an example, it is found that when a strong magnetic field is used at right angles to the arc 440 volts are required to maintain an arc 3 mm. long. In this way the arc remains active with considerably larger currents. In some cases the anode is of carbon and the cathode of copper, and in other cases both electrodes are of carbon, their ends being turned to sharp angular edges, and one carbon is slowly revolved by means of a small electric motor, so that any charge produced by the slight deposition of carbon is rectified by the presentation of another part of the edge. With the above modifications which have been added to Mr. Duddell's simple arc, shunted by self-induction and capacity, the frequency of the oscillations set up by the arc have been greatly increased, and the oscillating energy available from the arc has thus been rendered of service in connection with wireless telegraphy and telephony. At a short distance from the radiating circuit, a vacuum tube connected to a resonating coil was caused to glow brilliantly. On Mr. Poulsen bringing his hand near the resonating coil the capacity was charged to such an extent as to throw the coil out of tune, and the glow of the tube was extinguished. Another vertical resonating coil placed about two yards from the radiating circuit gave a powerful brush discharge; this brush discharge died down on the operator bringing his hands near to the resonating coil, and regained its original vigor on the removal of the operator's hands. A loop of insulated copper, short-circuited on itself, when held a short distance above the inductance coil in

the radiating circuit immediately became red hot and fused, and a group of ordinary incandescent lamps connected to a coil of insulated wire lit up brilliantly when the latter was held about a foot above the exciting coil. Among other experiments brought to the notice of the audience was that of lighting an incandescent lamp with several of the operators forming the conducting circuit. A point worthy of mention is that the arc from which the radiating energy is derived does not give out an audible musical note as in the case with lower frequencies, the obvious reason for this being that the frequency is so high that the note produced is beyond the range of the human ear.

The system of wireless telephony differs but little from the Poulsen system of wireless telegraphy. An ordinary telephone is arranged at the sending end so that the arc is influenced by the sound waves which are set up when the telephone is spoken into. The apparatus at the receiving end is very similar to that used for wireless telegraphy except that a telephone receiver is used. At the lecture delivered at the London Institution a gramophone provided with a telephone receiver was set to work on the lecture table, and the music played by the gramophone could be heard in another telephone receiver in a distant part of the building.

Mr. Poulsen has, we understand, succeeded in establishing connection between Berlin and Copenhagen, a distance of about 300 miles.—*The Engineer.*

MARCONI ON WIRELESS.—In a lecture delivered before the Royal Institution in London, Marconi stated that communication across the Atlantic by his new plant has never been interrupted for more than a few hours at a time since the commencement of commercial work on Oct. 17. Mr. Marconi referred to the difficulty met with in transmitting during certain hours of the day. These periods, he said, come in the morning and evening, when daylight or darkness extends only part way across the Atlantic. He read a letter from the *New York Times*, in which it was stated that since October last that journal had received from its correspondents in England and on the Continent news dispatches totaling 68,404 words, promptly and efficiently transmitted by wireless.—*Electrical World.*

MISCELLANEOUS.

A NEW METALLIC MIRROR FOR SEARCHLIGHTS.—Ever since the introduction of searchlights for battleships, attempts have been made from time to time to substitute a metallic mirror in place of glass ones. These latter are unsatisfactory owing to being so readily broken by concussion when firing the guns while the silvering at the back of the mirrors is very liable to blister and leave the surface of the glass. The difficulty of making true parabolic mirrors is claimed to have been overcome by the Cowper-Coles electrolytic process, which briefly consists of depositing by chemical means on the convex side of a glass former or mould a thin silver film, and then spinning the former in an electrolytic cell charged with copper anodes and a copper electrolyte so as to deposit the copper on the silver surface, the process being continued until the silver film has received a sufficient thickness of copper to give the desired rigidity to the parabolic mirror. The glass mould and the electro deposit are then removed from the depositing cell and placed in a vessel containing cold water, the temperature of which is gradually raised until the expansion of the copper is sufficient to cause the metallic mirror to leave the glass former. The silver-faced mirror thus produced has as highly polished a surface as the glass, and is finally subjected to an after-treatment to prevent the silver from tarnishing. A large number of mirrors made by this process have been supplied to the British government, some of which were sent out to the South African War. There is now being introduced a new metallic mirror which is only partially made by electro-deposition. The mirror has a surface composed of alternate bands or rings of gold and white reflecting surfaces, which it

is claimed gives a more penetrating beam of light, both at night and in foggy weather. Objects on which such a beam of light is thrown stand out in greater relief than in a light thrown from a silver-white metal mirror, and the intensity of the light is so great that it is impossible to aim accurately at the projector. Another advantage claimed for the new mirrors is that they are not fractured by concussion, and even when penetrated by bullets the area of distortion is very small.—*Page's Weekly.*

ENGLAND ASKS FOR MARITIME COUNCIL.—Great Britain has extended an invitation to the great maritime powers to participate in a conference in London to determine if possible on definite principles of maritime international law capable of being applied by the proposed prize court provided for at the last Hague Conference. The United States will be represented at this conference.

While the conference is designated as "informal," upon its deliberations and conclusions will undoubtedly depend the fate of the proposed international prize court. Should the conference of experts succeed in formulating a code of maritime law which shall become international by being accepted by the maritime Powers, the success of the proposed court would seem assured.

In the meantime it is predicted in an authoritative quarter that all governments will refrain from ratifying The Hague treaty establishing the prize court.

The precise difficulty which the British government is seeking to have remedied through the conference lies in the existence of "continental maritime law," and "Anglo-American maritime law," and the consequent question of which of these systems shall be administered in any given case before the court. It is explained that these two systems differ materially, and would, without question, be constantly in conflict in cases before the court. Should the matter of settling this question be left to the court, its powers would in effect be legislative as well as judicial, a proposition to which Great Britain declines to adhere.

Both Russia and Japan declined to sign the Prize Court agreement at The Hague on the same ground.

The objectionable feature of the treaty is contained in Article 7, which stipulates the law to be observed or interpreted by the court. It provides that where the relations between the nation which is before the court as the captor of the prize and the nation which is aggrieved are regulated by treaty, the terms of the treaty shall govern the court. In the absence of such a treaty the court shall apply the rules of international law.

Criticism is made of the last two provisions. As to matters of contraband, blockade and the doctrine of continuous voyage the Continental rules and the Anglo-American rules are at variance, and the conflict would at once arise as to which should become the basis of the action of the court.

Still another objection to this treaty has been found since it was transmitted to the United States Senate a short time ago, and this is that it might be held to justify an appeal from a decision of the United States Supreme Court, a procedure which is expressly prohibited by the American constitution.—*Nautical Gazette.*

ELECTRIC PROPULSION OF SHIPS.—In a recent paper read before the Institution of Engineers and Shipbuilders of Scotland, Mr. Henry A. Mavor advocated for ship propulsion induction motors direct connected to propeller shafts, current being supplied from turbo-generators. Among the notable advantages adduced is the reversibility of the electric motor, and its use would dispense with the present objectionable, heavy and costly go-astern turbines on the propeller shaft. Mr. Mavor gave details relating to a supposed ship of 17,000 horsepower having propellers 8 feet 1½ inches diameter running at 377 r. p. m. and a speed of 20¾ knots. The probable maximum efficiency of the propellers, he said, would be 62 per cent, and

an electric equipment would permit of the use of propellers of about 14 feet diameter at 140 r. p. m., and an efficiency not less than 70 per cent—an improvement more than sufficient to cover the loss in the electric motors. The slower speed propellers would be free from the risks of cavitation troubles which arose when the resistence was increased on a propeller already producing a high value of thrust per unit area. It would be found that the steam turbo-alternator as used on land in sizes corresponding to those then under discussion could deliver an electric horsepower to the motors for 12.2 pounds of steam per horsepower-hour, allowance having been made for all intermediate losses and for 4 per cent for driving auxiliaries, no superheat being used, so as to make the comparison with normal marine practice. This figure was startlingly lower than anything which had been touched at sea. It was for full speed and power, but the comparison must also be made at low speeds and powers, and more particularly at the normal working speed of the ship. There was certainty of economy in this comparison, because of the higher speed of revolution of the turbine, which in the electric case ran at the same speed for all powers, while, of course, the direct-connected turbine had to vary its speed with the speed of the ship. In the example given an estimate had been made of the weight, with the result that it appeared probable that the decrease in the weight of the steam equipment would more than compensate for the heavy, slow-running motors and propellers. The cost would probably closely follow the weight.—*Electrical World.*

REPORT ON DEEP WATER DIVING.—The Admiralty committee on deep water diving was appointed in August, 1905. Experiments have been carried out for the committee by Lieutenant G. C. Damant, R. N., Mr. A. Y. Catto, R. N., and Dr. A. E. Boycott, of Oxford. A report was completed and presented to the Admiralty at the end of 1906, but its publication has been delayed pending the completion of a further series of experiments carried out at the Lister Institute, and has only just been issued. It is a most interesting document, and proves that diving operations can be carried out with safety in depths up to 210 feet, provided proper precautions are adopted and suitable appliances used. Both Lieutenant Damant and Mr. Catto descended to that depth off the coast of Scotland, and experienced no ill results. The committee report that the respiratory distress which, under the conditions of diving hitherto obtaining, usually prevents divers from working at more than very moderate depths, such as 15 to 20 fathoms, is due to the pressure of carbon dioxide in the air in the helmet, and can be entirely obviated by increasing the supply of air in direct proportion to the increase in the absolute pressure. To enable a sufficient supply of air to be delivered to the divers two or more pumps should be coupled together when operations are being carried out in depths exceeding 18 fathoms. The serious dangers arising from the liberation of bubbles of nitrogen in the blood and tissues on the ascent of a diver from deep water can best be met by —(1) Limiting the time spent in deep water; and (2) ascending most of the distance rapidly, and afterwards making the last part of the ascent in stages, with stoppages interposed. The committee recommend that further experiments on certain points be carried out. Lieutenant Damant has recently been appointed inspector of diving in the navy.—*The Engineer.*

IMPROVEMENT IN BINNACLES.—It has been found from trials which have been made that a decided advantage is gained by having the inside of the tops or domes of the standard and steering compasses painted dead black instead of white, which is the customary color. The advantages claimed are—(1) that when it is necessary to take bearings with the top on, either by day or night, the operator is not dazzled by the reflected light from the white paint; (3) no light is reflected out on either side to hamper the officer of the watch, signalmen, and others in keeping a good look out; and

(3) there is less strain on the eyes of the man steering in keeping the ship on her compass course. The Admiralty have therefore directed that this alteration may be adopted in the ships of the fleet at the discretion of commanding officers, should they consider it desirable.—*Army and Navy Gazette.*

THE PRICE OF SPEED IN WARSHIPS.—At the present time, when the financial provisions for the navy are prominently before us, one is led to reflect upon the continual growth in the size and cost of war vessels, and to wonder where the increase is going to end. The cost of the old *Dreadnought* in 1875 was about £55 per ton of displacement, the cost of the 1907 battleship of that name just over £100 per ton of displacement, and while the cost per ton has thus nearly doubled, on account of the increase of size, the total cost of the ship has trebled. The price of the raw materials which go to make the finished ship has, we suppose, on the whole not materially altered in this period, and the greatly increased cost per ton is thus mainly due to the increase of the amount of labor which is put into the material. The successive improvements which have taken place in machinery have been in the direction of obtaining a greater output for a given weight, and this has inevitably meant more costly methods of production. It is not necessary to dwell on this point, instances of the truth of which will immediately occur to any one who thinks for a moment on any one of the numerous mechanical appliances which go to make up a modern warship; but, as a specific instance, we will only ask the reader to reflect upon the amount of labor which is put into a water-tube boiler weighing, say, 10 tons, compared with the amount of labor required in a cylindrical boiler of the same weight. The increase in cost, both total and per ton, may all be attributed to increase of speed in one form or another. The speed of the vessels has been steadily increasing, necessitating higher-powered machinery, and in order to obtain the increased speed without unduly increasing the power, length of ship and, therefore, displacement must also be increased. Speed of firing the guns has increased, leading to more elaborate and costly gun mountings, and a whole host of subsidiary appliances for handling the ammunition with a facility corresponding to the rapidity of fire; and, lastly, the increase of muzzle velocity of the projectiles has necessitated improvement in the armor so that the same weight of it shall have correspondingly greater resisting power.

The study of this process of evolution which is still going on, the various factors in it, and the way in which they react upon each other, is very fascinating, but on the present occasion we desire to limit attention to the question as affecting one class of war vessel—torpedo craft. The problem in this class does not involve the same complications as in the cruiser or battleship, since armor does not enter into the question at all, while the weight of armament is a small proportion of the displacement, and is governed mainly by considerations of stability and space. The evolution of this type of vessel has, therefore, been almost entirely in the direction of increase of speed, and, though some of the advance has been due to lighter hulls, as a result of the employment of high tensile steel, the main factor has been the successive improvement in the propelling machinery. The *Lightning*, the earliest vessel of the type, in 1877 attained the "unprecedented" speed of 17 knots, and was followed by a number of second-class torpedo boats of small displacement and about the same speed, some of which were intended to be carried on board battleships and cruisers. They had special arrangements for filling their boilers with hot water from the boilers of the parent ship through a hose connection on the vessel's side, with the idea that the boat could be lowered into the water and steam raised in a very short time and the boat despatched to deliver an attack on an enemy not many miles distant.

The possibilities of circumstances arising in actual warfare for such a use of these boats without hampering the movements of the parent ship

was seen to be remote. The additional "top hamper" which the carrying of them entailed was objectionable; they were extremely frail and liable to damage in the operations of hoisting and lowering; they were not very seaworthy and, of course, could not be lowered except in smooth water, and they consequently soon ceased to be carried. Though torpedo dropping gear is still fitted in the larger steamboats carried on board big ships, it has never been seriously proposed to return to a small torpedo-boat carried on board. These boats were followed in the eighties by a number of first-class torpedo-boats which, as they were capable of keeping the sea in moderate weather, may be considered as the real starting point in the line of sea-going torpedo craft. Their trial speeds were about 20 knots, and their indicate horsepower varied from 700 to 1500. The latter of these have in the last year or two been re-boilered with water-tube boilers in place of the locomotive boilers with which they were originally fitted. Following these, in the early nineties, came the larger boats Nos. 91, 92, etc., the first to be fitted with water-tube boilers. They displaced about 120 tons, the indicated horsepower was about 2000, and the speed 23 knots. The possibilities of the water tube boiler had for some time been under observation, and the great advantage which the small tube or "express" type gave in point of steam-giving capacity on a small weight made possible a large advance in size and speed, and the torpedo-boat destroyer was evolved. Thenceforward torpedo craft became divided into two distinct classes—the torpedo-boat proper and the torpedo-boat destroyer—and we need only, in the course of the present article, follow the development of the latter. The first torpedo-boat destroyers had a speed of 27 knots on trial with about 4500 indicated horsepower, and they displaced about 250 tons. As might be expected in vessels so large a step in advance of their predecessors, they did not live up to their trial performance on service. Following these, in the closing years of the last century, came the 30-knot boats, in which the displacement was further increased to about 360 tons and the indicated horsepower to 6000. Up to this time it was the custom to specify that the trials should be run carrying a certain load on board, and this load gave to the boat a displacement less than it would have on service, and, as in the case of the previous class, the speed fell off by two to three knots after the boat was commissioned. In the three vessels, *Express, Albatross,* and *Arab,* tried about the same time, an attempt was made to exceed the previous results by two or three knots, but the results were disappointing. The displacement in these boats was increased to about 450 tons and the indicated horsepower to 7500 in the case of the *Albatross,* to 9000 in the case of the *Express,* and it almost appeared that the limit of power had been reached with reciprocating engines of the type required in destroyers. As the result of experience with some of the 30-knot boats at sea it was deemed necessary in the *River* class which followed to increase the scantlings of the hull, and the displacement was increased to about 600 tons. The indicated horsepower was not advanced, remaining at 7500, consequently the speed was not so ambitious, but a departure was made in running the trials of these boats at their sea-going displacement. They all attained their designed speed of 25½ knots easily, and have maintained it on service, and except in dead smooth water they are on account of their size superior in speed to any of their predecessors. In the meantime the turbine was being steadily developed, and the *Viper* had shown that with this form of propulsion speeds were possible which from previous experience seemed out of reach with reciprocating engines. The experiments with oil fuel at the same time showed that by this means steam production could be increased, and it was a logical conclusion to combine the oil-fired boilers with turbine engines, so that the latter could take full advantage of the increased capacity of the former. The result was the *Tribal* class, where the displacement is increased to nearly 900 tons and the horsepower to 15,000. The combination of oil fuel and turbines is still further to be tested in the *Swift,* now nearing completion, where the

designed speed is 36 knots, which is estimated will be obtained with 30,000 horsepower, and the displacement is no less than 1800 tons.

The preceding sketch of the development of the destroyer is necessarily brief, and some details have been omitted, but it serves to show at what price speed has been obtained. Except in the case of the *Amazon* and the *Saracen* of the *Tribal* class, and the *Swift*, which carry 4-inch guns, none of these destroyers carry anything bigger than a 12-pounder, and as regards torpedo armament there is little to choose between any of them. The larger vessels have, of course, better sea-keeping qualities, and higher possible speeds in rough water; but apart from this practically the only advantage gained by the increase in size has been that of speed. From the trial results of the *Tribal* class the *Swift* should reach her 36 knots, providing propeller difficulties do not intervene, and it is not difficult to predict what still further increase in speed would involve. To get 40 knots would mean a vessel of 3000 tons displacement with about 55,000 horsepower. The cost of the *Swift* is given in the estimates as a quarter of a million; the cost of the 40-knotter would be nearly half a million. It may reasonably be asked, are we getting an adequate return for the outlay on these vessels? and is the increase in speed which has been obtained sufficient justification for the very great increase of size?

It appears difficult as the size and speed increases to increase the fuel capacity in proportion, and consequently the price paid for speed is not only the increased monetary cost but a diminution of the radius of action. In a previous article—see *The Engineer* of January 10—we pointed out that the *Tribal* class compare unfavorably with the earlier 30-knot destroyers in this quality. In the *Swift* the deficiency is even more glaring. The oil capacity of this vessel is given in the estimates as 180 tons, which at full speed will give a radius of action of under 300 miles, while at 13 knots it will be under 1000 miles. Possibly provision is to be made for additional stowage above the 180 tons which is the capacity at load draft, otherwise it is difficult to see what possible use a craft with such a limited radius of action can have. The results which have been obtained are, as we pointed out in the article previously referred to, very gratifying; much valuable experience has been gained, in this respect the vessels so far completed have fully justified the expenditure upon them. It must, however, be patent to every intelligent observer that we have in the later vessels reached a point, if we have not already gone beyond it, where the gain in speed is no longer commensurate with the cost of obtaining it, both in money and diminution of radius of action, and we shall be surprised if the 16 new destroyers to be commenced under this year's program do not show that this fact has been appreciated.—*The Engineer.*

BOOK NOTICES

"The Art of Naval Warfare." By Admiral Sir Cyprian Bridge, G. C. B. London: Smith Elder & Co., 1907.

This little work is not properly described in its sub-title. Instead of being merely "Introductory Observations," which might be expected to wander aimlessly about and around the subject of naval warfare, it is a succinct presentation of the fundamental principles of the art, written with exceptional clearness and in charming style. In no sense is it obscure or pedantic. The general impression left on the mind of the reader may best be expressed as "common-sense" or "level-headed." In these days when so many of us are given to sending up literary balloons (whose altitude is due to their gift of levitation), it is refreshing to meet a wise old officer who reminds us at every turn that our profession is based on certain immutable laws to be apprehended only through the touchstone of history; that these laws are made applicable through mechanical and educational methods which vary with the age, but which are the slaves, not the masters, of the lamp; that the human element has always dominated; that good material, while valuable, is no substitute for lack of strategical grasp or tactical skill. "Naval history," he says, "demonstrates that often—indeed more often than not—it was the side with inferior material equipment that won"; that we make too many reports, send in too many letters; that we need de-centralization afloat and a sound organization at the admiralty; that a proper distribution of force is a matter for times of peace which may not be postponed till war breaks out; that our shore establishments should be "the fewest that we can manage to do with"; that fixed supply bases in distant parts are a mistake; that "no element of the naval strategy of peace is more important than the training of officers and men"; that "drill" and "training" are not convertible terms; that captains should be so trained as intuitively to do the right thing in battle; that it is practically impossible to maintain secrecy about material; that "as you sow in peace, so must you expect to reap in war"; that coast defence, as generally understood, is folly; that, in its true meaning, coast defence is to stop an enemy from crossing the sea to land on your shores; that it is very easy to divert too great a share of our expenditures to auxiliaries or special craft; that a parallel exists to the "House that Jack Built," such as "the battery defends the anchorage; the infantry defends the battery; underwater mines defend the channel; electric lights and quick-firing guns defend the mines; a movable force defends the electric lights and the quick-firing guns," etc., while as a matter of fact the sea-going navy, which is sometimes unnoticed, defends the whole; that you

should make your enemy so busy about his own security that his eagerness to invade your country may be expected to cool; that the inclination of the lawyer turned politician to pose as a strategist is ineradicable; that scouting is of the first importance; that the force back of the scouts will lie, not in the armament of the scouting vessels, but in that of the supporting fighting ships; that speed may be a luxury rather than a necessity, and is not of commanding importance in strategy; that uniform speed in a squadron is better than high speed in a few of its units; that the admiral trained in maneuvering his squadron will easily surpass his mental superiors not so equipped; that we can count a possible enemy's ships and guns, etc., but we cannot forecast the ability of his commanders," etc., etc.

Particularly is Sir Cyprian's counsel timely and commendable when he says: "When war begins the first enemy to fight against is not the one that is going to attack or resist you with material means, but the more insidious foe in your own nature which will assail you stoutly with the ideas and habits produced and nourished by the practices of peace. To beat down this formidable foe we must learn what war is; and in time of peace we can learn that only by intelligent study of the history of warfare and by the proper application of the lessons which it supplies."

It has been far from my thought to skim the cream of this delightful little book, rather have I wished to present some of its numerous admirable suggestions as a whet to the appetite in the hope that many may be tempted to read it for their enjoyment, if, happily, not requiring its conclusions for their enlightenment.

C. F. GOODRICH.

"Wrinkles in Practical Navigation." By Captain T. S. Lecky. 15th edition; revised and enlarged by Wm. Allingham; published by George Philip & Son, London, England.

To those already familiar with this valuable work no word of approval is necessary; they know its merits and are ever ready to acknowledge its gifted author to have been an authority on all matters pertaining to practical navigation. To those unfamiliar with it, this book is commended as a compilation of nautical knowledge, at once comprehensive, well-arranged, and correct in principle; written in plain language and with as little show of mathematics as possible. It should not only be studied for the varied and excellent information it will give, but, considered only as a book of reference, it should be found in every seaman's library.

The revision by Captain Lecky's friend and pupil, Mr. William Allingham, has brought the book up-to-date in every particular; the new parts and parts re-written are no less meritorious than the original work itself.

Besides useful tables and numerous appendices on various subjects, the book consists of 18 chapters in which are considered the various navigational instruments with many practical points for their use, the accepted methods of obtaining a ship's position, the compensation of the compass, and in which will be found much useful information that should be within reach of every navigator.

"Statistical and Chronological History of the United States Navy, 1775-1907." By Robert W. Neeser.

Bibliography.

Manuscript sources:

U. S. Government Archives in Washington, D. C.; British Admiralty Records, in London; Archives de la Marine, in Paris.

Official publications:

About four thousand public documents listed. Also, over two thousand 'private' documents (Congressional Documents).

Unofficial publications:

Two thousand publications listed (making a total of over 8000 publications.

Indexes: Subject, author.

Part I. Administration of the Navy Department, and events and dates of interests in U. S. Naval History.

Part II. Engagements, expeditions,, and captures of vessels of war.

Part III. Captures of merchantmen.

The above have been completed, and are ready for publication; they comprise the entire history of the navy, and record every event.

The following parts have been outlined, and begun, but will not be ready before three to four to five years.

Part IV. A complete history of every vessel's history and fate (1750 vessels of the U. S. Navy).

Part V. Statistical tables.

Part VI. American Privateers, 1772-1862; The State Navies of the Revolutionary War; The Confederate States Navy, 1861-1865.

All accounts have been consulted for every and each separate event; and not only is a complete bibliography given for the entire subject, but also for each individual event to all M. S., and published sources.

"The 1908 illustrated Catalogue and Price List of The Lunkenheimer Company" has just been issued, and can be obtained free of charge upon application to the company by anyone interested in their line of engineering specialties.

This book is of 564 pages, profusely illustrated, and includes tables and useful data. The Lunkenheimer Company, Cincinnati, Ohio.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

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SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

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1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

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NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-fourth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fee to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly, and may be obtained by non-members upon application to the Secretary and Treasurer at Annapolis, Md. Inventors of articles connected with the naval profession will be afforded an opportunity of exhibiting and explaining their inventions. A description of such inventions as may be deemed by the Board of Control of use to the service will be published in the Proceedings.

Single copies of the Proceedings, $1.00. Back numbers and complete sets can be obtained by applying to the Secretary and Treasurer, Annapolis, Md.

Annual subscriptions for non-members, $3.50. Annual dues for members and associate members, $3.00. Life members fee, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1909.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1909. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention, may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

PHILIP R. ALGER,
Professor, U. S. N., Secretary and Treasurer.

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CONTENTS

No. 127.

ALMA MATER. By Lieut. Ridgely Hunt, U. S. Navy (Retired) 755

WAR ON THE SEA—Continued. By Captain Gabriel Darrieus, French Navy. Translated by Prof. Philip R. Alger, U. S. N. 821

CLOSING EVENTS OF THE WAR WITH TRIPOLI, 1804-1805. By Robert S. Rodgers 889

DECATUR AND COLERIDGE. By Capt. C. G. Calkins, U. S. Navy (Retired) 917

THE CONQUEST OF TERRITORY OVER SEAS 957

ON A SYSTEM OF LIGHTING SHIPS AND LIGHTHOUSES IN SUBSTITUTION FOR THE ONES AT PRESENT IN USE. By John Herbert Claiborne, M. D., New York. Together with Some Experimental Observations in this Direction. By Julian S. Jones, Attorney-at-Law, Baltimore, Md. 1005

INSTANTANEOUS POSITION PLOTTER AND COURSE INDICATOR. By Commander Roy C. Smith, U. S. Navy 1019

THE FIRING INTERVAL. By Prof. Philip R. Alger, U. S. Navy 1023

ON THE MEANING AND USE OF ENTROPY. By Asst. Naval Constructor William McEntee, U. S. Navy 1031

THE EMPLOYMENT OF SUBMARINE MINES IN FUTURE NAVAL WARS. Translated by Philip R. Alger, U. S. N. 1039

TO ADJUST RANGE FINDERS BEFORE BATTLE. By Captain Bradley A. Fiske, U. S. Navy 1043

TO FIND THE FLEET SPEED AND CORRESPONDING REVOLUTIONS. By Captain Bradley A. Fiske, U. S. Navy 1045

DISCUSSION 1047

PROFESSIONAL NOTES. Prepared by Prof. Philip R. Alger, U. S. N. 1050
Ships of War, Budgets and Personnel.—Ordnance and Gunnery. Torpedoes.—Marine Turbines and Gas Engines. Liquid Fuel.—Miscellaneous.

BOOK NOTICES 1091

LIST OF PRIZE ESSAYS 1093

SPECIAL NOTICE.—Naval Institute Prize Essay, 1909 1098

ADVERTISEMENTS.

No. 128.

GAS *vs.* STEAM FOR MARINE MOTIVE POWER. By Captain A. B. Willits U. S. N. 1099

THE PRESENT PHASE OF THE PERSONNEL QUESTION. By Commander Roy C. Smith, U. S. N. 1129

SERVICES OF COMMODORE JOHN RODGERS IN OUR WARS WITH THE BARBARY CORSAIRS (1802-1806). By Charles Oscar Paullin 1141

A FAIR BASIS FOR COMPETITION IN BATTLE PRACTICE. By Captain Bradley A. Fiske, U. S. N. 1189

THE SUMMARY COURT-MARTIAL—PAST, PRESENT, AND FUTURE. By Lieut.-Commander J. P. Morton, U. S. N. 1199

EFFICIENCY AS A BASIS OF ORGANIZATION AND WAGES. By Harrington Emerson 1207

THE AZIMUTH DIAGRAM, AND ITS AVAILABILITY FOR THE SOLUTION OF VARIOUS PROBLEMS IN NAVIGATION. By Lieut.-Commander G. W. Logan, U. S. N. 1253

THE LUNAR OBSERVATION WITHOUT DISTANCE TABLES. By H. B. Goodwin 1261

CHANGE IN DEVIATION OF THE COMPASS DUE TO CHANGE IN TRIM. By Lieut.-Commander Lloyd H. Chandler, U. S. N. 1269

A SHORT ACCOUNT OF LEGISLATIVE ACTION IN REGARD TO THE UNITED STATES NAVY UP TO THE WAR OF 1812, AND NOTES CONCERNING THE HISTORIES OF NAVAL VESSELS DURING THAT PERIOD. By Surgeon A. Farenholt, U. S. N. 1279

A CURIOUS FACT ABOUT SPOTTING. By Captain Bradley A. Fiske, U. S. N. 1297

ALTITUDE AND AZIMUTH TABLES FOR FACILITATING THE DETERMINATION OF LINES OF POSITION AND GEOGRAPHICAL POSITION AT SEA. The Simplest and Readiest in Solution. By Lieut. Radler de Aquino, B. N. 1299

DISCUSSION 1313

PROFESSIONAL NOTES. Prepared by Prof. Philip R. Alger, U. S. N. 1317
Ships of War, Budgets and Personnel.—Ordnance and Gunnery. Torpedoes.—Marine Turbines and Gas Engines. Liquid Fuel.—Miscellaneous.

BOOK NOTICES 1356

LIST OF PRIZE ESSAYS 1361

INDEX TO VOLUME 34 1365

SPECIAL NOTICE.—Naval Institute Prize Essay, 1909 1370

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